PB86-105186

Draft Environmental Impact Statement for North Pinellas County, Florida Wastewater Facilities

(U.S.) Environmental Protection Agency
Atlanta, GA

Apr 85

U.S. Department of Commerce
National Technical Information Service
NTIS

PB86-105186

United States
Environmental Protection
Agency

Region 4
345 Courtland Street, NE
Atlanta, GA 30365

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APRIL 1985

EPA

Environmental Impact Statement

Draft

North Pinella County, Florida Wastewater Facilities

REPRODUCED BY
NATIONAL TECHNICAL
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SPRINGFIELD, VA. 22161

Draft
Environmental Impact Statement
for
North Pinellas County, Florida

Prepared by

U.S. Environmental Protection Agency
Region IV
Atlanta, Georgia

This Draft EIS addresses proposed wastewater management facilities for northern Pinellas County, Florida. The major elements of the EIS include: (1) the development and evaluation of wastewater disposal alternatives for existing municipal wastewater treatment facilities, (2) the development and evaluation of wastewater management alternatives for the area east of Lake Tarpon, (3) the evaluation of the environmental effects and costs associated with the disposal of wastewater through a Gulf outfall, and (4) the evaluation of wastewater reuse in the study area.

Due to lack of approved wasteload allocations for most of Pinellas County's surface waters, a study area wide preferred alternative cannot be selected. EIS conclusions or recommendations that can be made include: (1) No federal action related to funding wastewater facilties east of Lake Tarpon, (2) the identification of wastewater reuse as the environmentally preferred wastewater management alternative for the study area, and (3) general findings related to the disposal of wastewater through a Gulf outfall near northern Pinellas County.

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APPROVED BY:

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Regional Administrator

March 19, 1985
Date

U. S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV - ATLANTA

NORTH PINELLAS COUNTY,
FLORIDA

ENVIRONMENTAL IMPACT STATEMENT

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EXECUTIVE SUMMARY FOR THE ENVIRONMENTAL IMPACT STATEMENT FOR

NORTH PINELLAS COUNTY, FLORIDA WASTEWATER FACILITIES

Draft (X)
Final ( )

Environmental Protection Agency
Region IV
345 Courtland Street
Atlanta, Georgia 30365

Type of Action:

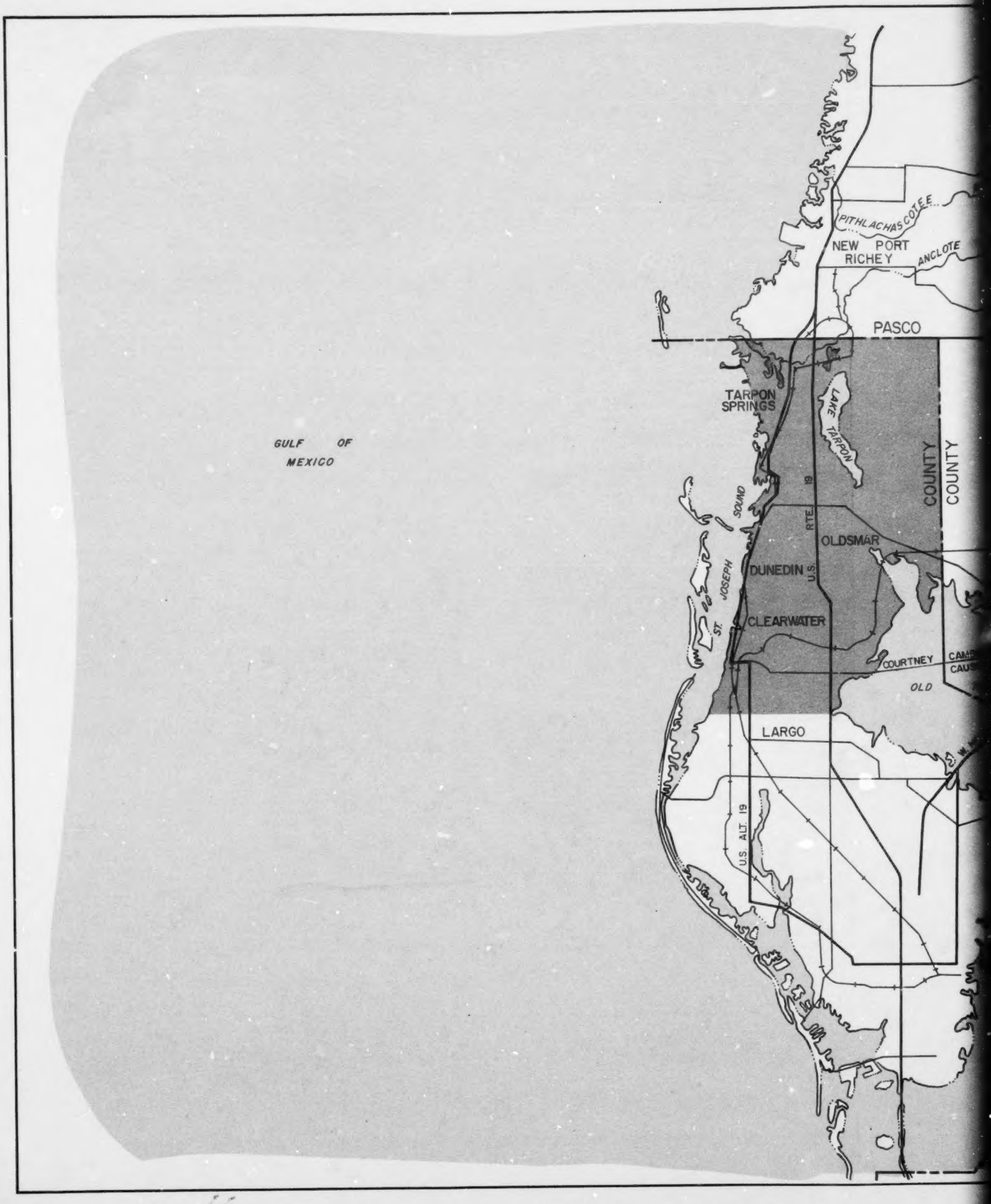
Administrative Action (X)
Legislative Summary ( )

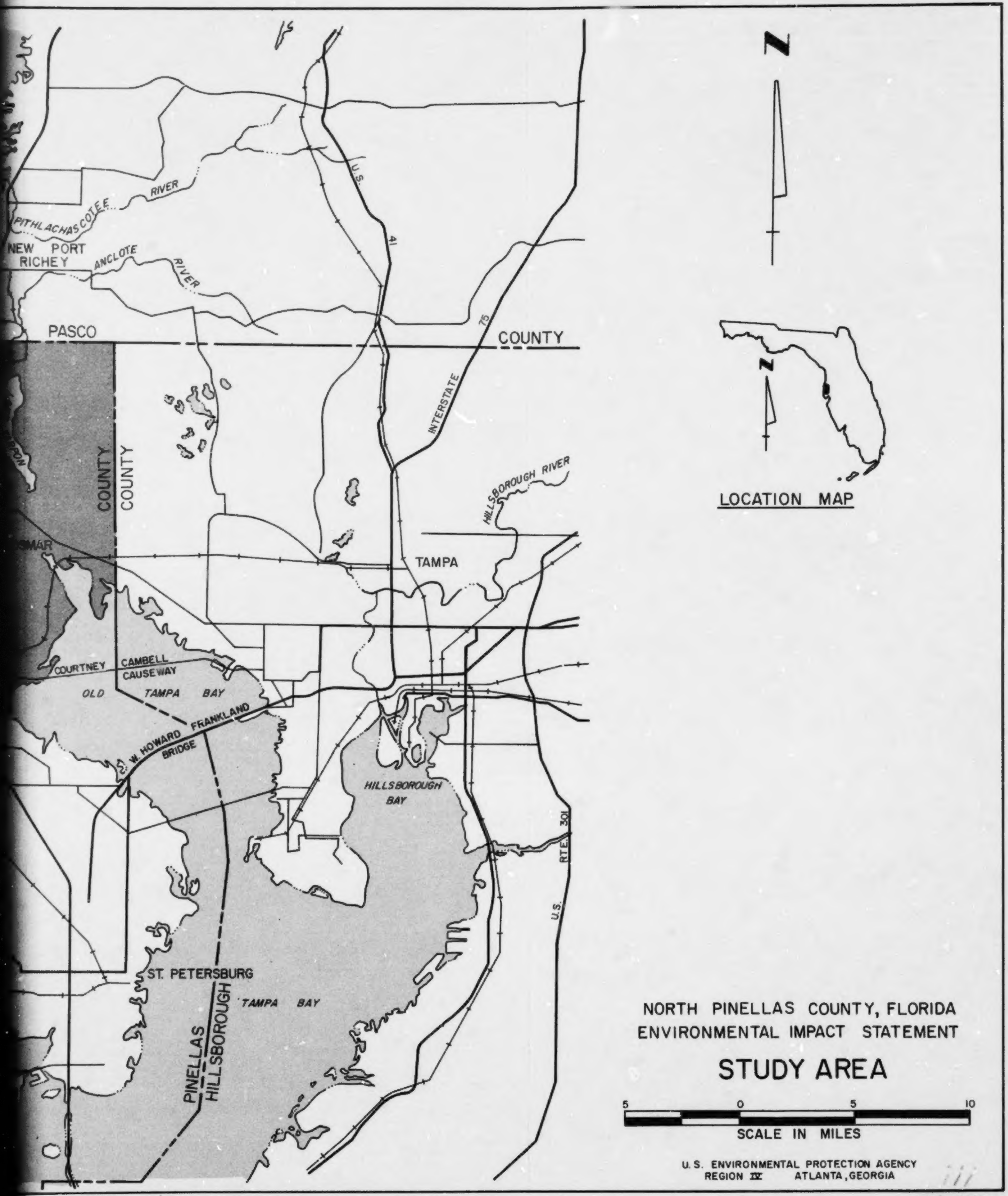
EXECUTIVE SUMMARY

PART A - NEED FOR ACTION

The Environmental Impact Statement (EIS) for North Pinellas County, Florida addresses alternative wastewater treatment-disposal systems and the potential impacts of these systems. The Study Area for the EIS includes the northern half of Pinellas County including all of the City of Clearwater and locations within the county north of Clearwater as shown on Figure i.

Facilities planning for the EIS Study Area, based on Section 201 of the 1972 Federal Water Pollution Control Act, was accomplished through the North Pinellas County 201 Plan (which included areas within the County north of the City of Clearwater: Dunedin, Oldsmar, Tarpon Springs and unincorporated areas) and the Central Pinellas County 201 Plan (which included the Cities of Clearwater and Safety Harbor and areas further south). Recommendations of the 201 Plans are summarized in Table i and the service areas are shown on


PITHLACHASCOTEE
NEW PORT RICHEY
ANCLOTE
PASCO
TARPON SPRINGS
LAKE TARPON
GULF OF MEXICO
COUNTY
COUNTY
ST. JOSEPH SOUND
U.S. RTE. 19
OLDSMAR
DUNEDIN
CLEARWATER
COURTNEY CAMP CAUS
OLD
LARGO
U.S. ALT. 19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LOCATION MAP
N
PITHLACHASCOTEE RIVER
NEW PORT RICHEY
ANCLOTE RIVER
U.S. 41
INTERSTATE 75
PASCO COUNTY
COUNTY
COUNTY
HILLSBOROUGH RIVER
TAMPA
COURTNEY CAMBELL CAUSEWAY
OLD TAMPA BAY
W. HOWARD FRANKLAND BRIDGE
HILLSBOROUGH BAY
U.S. RTE. 301
ST. PETERSBURG
TAMPA BAY
PINELLAS
HILLSBOROUGH
5
0
5
10
SCALE IN MILES

NORTH PINELLAS COUNTY, FLORIDA
ENVIRONMENTAL IMPACT STATEMENT

STUDY AREA

U. S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV ATLANTA, GEORGIA

iii

FIGURE i

TABLE 1

WASTEWATER SERVICE AREAS IN THE NORTH PINELLAS COUNTY EIS STUDY AREA

Service Area	1984 Capacity (MGD) / 1984 Flow (MGD)(3)	Year 2000 Projected Flows (MGD)(3)	Current Wastewater Treatment Levels	Effluent Disposal: Current Method	Effluent Disposal: Method Recom. in 201 Plan
Clearwater					
East Plant	$\frac{5.0}{3.3}$	5.3	Secondary plus effluent filtration	Discharge to Old Tampa Bay, 650 ft. from shore	Deep-well injection near the treatment plant
Marshall St. Plant	$\frac{10.0}{6.3}$	8.6-10.0	Secondary plus nitrification	Discharge to Stevenson Creek to Clearwater Harbor	Deep-well injection near the treatment plant
Northeast Plant(1)	$\frac{8.0}{4.6}$	12.0	Secondary (with filters being installed)	Effluent discharged through East Plant's outfall	Deep-well injection near East Plant in combination with East Plant
Dunedin					
Mainland Plant	$\frac{4.0}{3.3}$	5.5-7.0	Secondary	Discharge to St. Joseph Sound, 1000 ft. from shoreline	Gulf outfall
Oldsmar					
Oldsmar Plant	$\frac{1.0}{0.75}$	4.5(2)-7.5(2)	Secondary with nitrification	Evap.-perc. ponds	Spray irrigation as primary method; perc. ponds as backup method.

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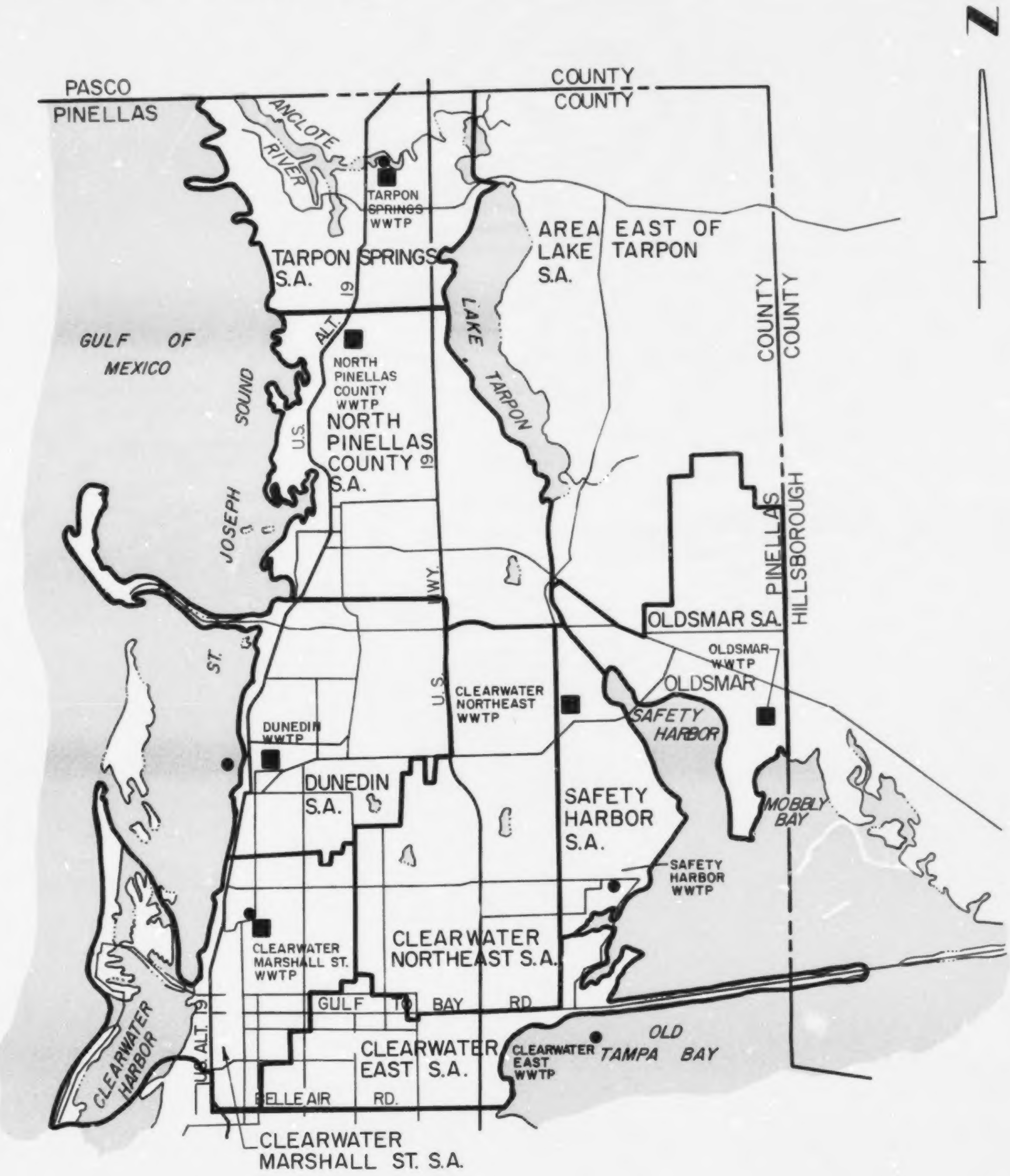
TABLE i
(Continued)

Service Area	1984 Capacity (MGD) / 1984 Flow (MGD) (3)	Year 2000 Projected Flows (MGD) (3)	Current Wastewater Treatment Levels	Effluent Disposal: Current Method	Effluent Disposal: Method Recom. in 201 Plan
Pinellas County					
N. Pinellas Co. Plant	$\frac{3.0}{1.3}$	4.5-10	Secondary	Spray irrigation	Spray irrigation as primary method; Gulf outfall as backup method
Safety Harbor					
Safety Harbor Plant	$\frac{0.35}{0.11}$	Redirect flow to Clearwater N.E. Plant	Secondary	Discharge to Mullet Creek to Old Tamp Bay	Redirect flow to Clearwater N.E. Plant
Tarpon Springs					
Tarpon Springs Plant	$\frac{1.25}{1.8}$	4.0	Secondary plus nitrification	Discharge to Anclote River	Spray irrigation as primary method; Gulf outfall as backup method
Area East of Lake Tarpon	$\frac{< 0.5}{< 0.5}$	3.5	Secondary (package plants) and on-lot systems	Holding pond and reuse on golf courses	Conveyance to Clearwater Northeast WWTP

(1) Includes Safety Harbor's flows

(2) Includes 3.5 MGD from unsewered area East of Lake Tarpon

(3) Based on most recent conversations with representatives from each service area.



N
PASCO
PINELLAS
COUNTY
COUNTY
ANCLOTE RIVER
TARPON SPRINGS WWTP
TARPON SPRINGS S.A.
AREA EAST OF LAKE TARPON S.A.
ALT. 19
GULF OF MEXICO
NORTH PINELLAS COUNTY WWTP
LAKE TARPON
COUNTY
COUNTY
SOUND
U.S. 19
NORTH PINELLAS COUNTY S.A.
JOSEPH
PINELLAS
HILLSBOROUGH
U.S. HWY.
OLDSMAR S.A.
ST.
OLDSMAR WWTP
OLDSMAR
CLEARWATER NORTHEAST WWTP
SAFETY HARBOR
DUNEDIN WWTP
DUNEDIN S.A.
SAFETY HARBOR S.A.
MOBBLY BAY
SAFETY HARBOR WWTP
CLEARWATER MARSHALL ST. WWTP
CLEARWATER NORTHEAST S.A.
GULF TO BAY RD.
OLD TAMPA BAY
CLEARWATER HARBOR
ALT. 19
U.S.
CLEARWATER EAST S.A.
CLEARWATER EAST WWTP
BELLEAIR RD.
CLEARWATER MARSHALL ST. S.A.

LEGEND

S.A.	SERVICE AREA
WWTP ■	WASTEWATER TREATMENT PLANT
●	SURFACE WATER DISCHARGE POINT

SOURCES: 1. PINELLAS COUNTY SEWER SYSTEM FEBRUARY 1979

2. OLDSMAR-PINELLAS COUNTY AGREEMENT DECEMBER 1979

NORTH PINELLAS COUNTY, FLORIDA
ENVIRONMENTAL IMPACT STATEMENT

MUNICIPAL WASTEWATER SERVICE AREAS

2 1 0 2 4
SCALE IN MILES

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV ATLANTA, GEORGIA

FIGURE ii

Figure ii. All existing nearshore surface water discharges were to be replaced by several deep well injection and spray irrigation alternatives. A Gulf outfall was also recommended as both a primary and a back-up disposal method.

Review of the facilities plans raised substantive questions concerning the disposal options of deep well injection and a Gulf outfall, lack of wasteload allocations to area surface waters and the impact of sewering the environmentally sensitive area east of Lake Tarpon.

Based upon the concerns raised in the 201 Plans and through the review and scoping processes, the following issues were identified as the major elements of the EIS:

- Development and evaluation of wastewater disposal alternatives for the numerous municipal wastewater treatment facilities;
- Development and evaluation of wastewater management alternatives for the developing area east of Lake Tarpon;
- Evaluation of the environmental effects and costs associated with the disposal of wastewater through a Gulf outfall; and
- Evaluation of water conservation and wastewater reuse in light of existing groundwater supply limitations in the Study Area.

PART B - DEVELOPMENT AND EVALUATION OF ALTERNATIVES

Six basic wastewater disposal alternatives were evaluated for the existing municipal facilities:

- Discharge to coastal waters (Old Tampa Bay, Clearwater Harbor-St. Joseph Sound or the Anclote River);

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- A Gulf outfall extending from Clearwater Beach Island, Honeymoon Island or the mainland north of Honeymoon Island;

- Deep well injection at the Marshall St. Plant or south of the Study Area possibly at the County's McKay Creek Wastewater Treatment Plant and injection site;

- Slow rate (spray irrigation) or rapid rate (rapid infiltration) land application;

- Wastewater reuse of nonpotable wastewater for irrigating recreational or other open land areas and industrial cooling and service water; and

- The No Federal Action (no-action) alternative.

The service areas and the basic disposal options were combined to form individual, sub-regional (2 or more service areas combined) and regional (all seven service areas combined with a total projected flow for the year 2000 of 43 million gallons of wastewater per day (MGD)) disposal alternatives. These alternatives were screened with some being eliminated because of cost or environmental reasons.

1) Cost Analysis

(a) Tampa Bay Subarea Cost Summary

The Old Tampa Bay Subarea involves facilities (Oldsmar, Clearwater Northeast, and Clearwater East) with proposed discharges to Upper Old Tampa Bay (north of the Courtney Campbell Causeway) or Lower Old Tampa Bay (south of the Causeway). The general findings of the cost analysis are summarized below:

- The individual service area disposal options with a surface water discharge treated to secondary levels with no outfall extension are least costly;

- Regional and sub-regional options are more costly than individual options;

- A sub-regional alternative combining all facilities for a discharge to Lower Old Tampa Bay at secondary treatment levels is the least costly non-individual service area option;

- Reuse plus secondary treatment and filtration is cost competitive with regional Gulf outfall and deep well injection options; and

- The regional Gulf outfall option (with secondary treatment and with the outfall located four miles offshore from Honeymoon Island) is cost competitive with the regional deep-well injection option.

(b) Clearwater Harbor - St. Joseph Sound Subarea Cost Summary

The Clearwater Harbor - St. Joseph Sound Subarea includes the Clearwater Marshall Street and Dunedin treatment plants. General findings of the cost analysis are summarized as follows:

- The individual service area disposal options with a surface water discharge are least costly;

- Reuse plus secondary treatment and filtration are less costly than regional Gulf outfall or deep well injection options; and

- The regional Gulf outfall option is cost competitive with the regional deep well injection option (but at a higher level of costs than the individual service area options).

(c) North Pinellas County Subarea Cost Summary

Rapid rate land application as an individual disposal option is the least costly alternative.

(d) Tarpon Springs Subarea Cost Summary

The Tarpon Springs wastewater service area is the Tarpon Springs Subarea. The Anclote River has been assigned a wasteload allocation by the Florida Department of Environmental Regulation (DER). Discharge of wastewater, treated to advanced secondary treatment (AST) levels, is the least costly disposal option that is judged environmentally acceptable. Some of the unincorporated area northeast of Lake Tarpon may also be served by the Tarpon Springs Wastewater Treatment Plant.

(e) Area East of Lake Tarpon

A range of alternatives including on-lot and community systems, land application and a centralized sewer system were considered for this area. The costs for on-lot and small community systems are based on an analysis of three planned residential communities east of Lake Tarpon. The costs are for existing residences and capacity for future growth. Annual user costs for screened alternatives are:

Treatment Alternative	Annual User Cost
Community Sand Mound-Septic Tank effluent pump system	$386
Land application following secondary treatment	$393
Centralized system with treatment at Oldsmar WWTP	$400

2) Evaluation of Non-Monetary Factors

The alternatives also were evaluated on the basis of expected environmental impacts (with emphasis on aquatic environment, public health and recreation), operability constraints and implementability limitations.

Implementability, operability, and environmental impact factors are presented in Table ii.

The expected environmental impacts, operability constraints and implementability limitations for the area east of Lake Tarpon are summarized in Table iii.

PART C - CONCLUSIONS

In the absence of approved wasteload allocations for area surface waters (except the Anclote River), EPA can not, in this EIS, select a preferred alternative for wastewater disposal for all of North Pinellas County. The EIS must instead be viewed as providing input to the Florida DER in their wasteload allocation decisions. The Draft EIS can serve the purpose of narrowing the field of reasonable alternatives; presenting the costs associated with various effluent limitation combinations; and identifying expected environmental impacts, operability constraints and implementability limitations associated with the alternatives. The identification of the most cost effective, environmentally sound disposal alternative that would be eligible for EPA funding can not be accomplished until the wasteload allocation process is completed. An environmentally preferred alternative of wastewater reuse can, however, be identified in the Draft EIS. Additionally, decisions concerning EPA's role in wastewater management east of Lake Tarpon are not dependent on wasteload allocations and therefore can be described in the Draft EIS.

Decisions have already been made concerning the Tarpon Springs discharge to the Anclote River, because wasteload allocations have been established and approved. Further decisions concerning Tarpon Springs are not necessary.

Decisions in the North Pinellas service area can be made independently of wasteload allocations. Land application of treated wastewater on-site or at the Innisbrook Country Club is the most cost-effective, environmentally sound disposal option regardless of the level of treatment provided prior to any surface water discharge option.

TABLE ii

IMPLEMENTABILITY, OPERABILITY AND ENVIRONMENTAL IMPACT FACTORS OF BASIC DISPOSAL OPTIONS

Option	Implementability/Operability	Environmental Impacts
Discharge to Coastal Waters	Approved wasteload allocations for discharges are unavailable. Wastewater discharges are constrained because all Pinellas County waters are state designated Outstanding Florida Waters and Class II (shellfish harvesting) waters.	Water quality impacts (and impacts on beach use, grass beds, aquatic ecosystem, etc.) determined by quality of effluent discharged (continued degradation is expected with secondary treatment levels and improvement with AWT). Non-point source controls in some waters may be needed for further water quality improvements.
Gulf Outfall	Public acceptability is uncertain. No Gulf outfalls currently exist in Region IV. Outfall operation is proven technology.	Construction: 12 acres of bottom habitat potentially altered or destroyed per mile of pipeline. Outfall corridor could be sited to minimize construction impacts. Operation: Benthic community within 100-200 feet of discharge would be altered. Potential for beaches, reefs and other sensitive areas to be impacted. Estuarine water quality would be improved by removal of near shore surface water discharges.
Deep Well Injection	Was first thought not viable at Clearwater East Plant site. Funding for additional testing is being sought by Clearwater. Proven to be implementable south of the Study Area. May be viable in southwest section of Clearwater. 28 month testing program required for new disposal sites.	Estuarine water quality would probably improve. Could help retard saltwater intrusion into potable aquifer zones.

TABLE 11

IMPLEMENTABILITY, OPERABILITY AND ENVIRONMENTAL IMPACT FACTORS OF BASIC DISPOSAL OPTIONS

Option	Implementability/Operability	Environmental Impacts
Land Application	Land availability, zoning changes and land cost are implementation issues. Under-drains may be required in many areas because of high groundwater table. Back-up disposal method and/or large retention capacity is needed.	Surface water quality would improve. Land use alteration and conversion could occur. Wildlife habitat could be altered. Potential groundwater recharge advantages.
Non-potable Reuse at parks, golf courses and other lands	Proven to be implementable in neighboring St. Petersburg. Costs are usually higher than other disposal alternatives. Back-up disposal method is needed. Land availability is an issue.	Limited area groundwater supplies could benefit by both conservation and reuse. Potential health risk if reuse system is not secured from casual human contact with wastewater. Reduced surface water discharges would potentially result in water quality improvements.

TABLE iii

COMPARATIVE FEATURES OF WASTEWATER MANAGEMENT ALTERNATIVES FOR THE AREA EAST OF LAKE TARPON

Alternative	
Sand-Mounds with STEP Systems	1) No surface water discharge 2) Minimal public health concerns with properly functioning systems 3) Terrestrial ecosystem impacts minimal 4) Without centralized systems, densities may be decreased resulting in reduced impacts on wetlands, flood-prone areas, recharge areas 5) Low cost alternative 6) Malfunctions could result in public health, recreation and odor impacts 7) Shallow groundwater supplies could be affected by nitrate increases 8) Soil suitability limited to southern portion of area east of Lake Tarpon
Package Plants with land application	1) No surface water discharge 2) Minimal public concerns with properly functioning systems 3) Same as 4) above 4) Existing developments are using this technique now 5) Low cost alternative 6) Open space would be maintained for Land Application and other uses 7) Same as 6) above 8) Same as 7) above 9) Storage required for wet weather periods 10) Large portions of potentially developable land are required for land application 11) Some vegetation removal required
Centralized System with Treatment at Oldsmar WWTP	1) No groundwater concerns 2) No operability constraints 3) High cost alternative when disposal costs are added

TABLE iii (Cont'd.)

COMPARATIVE FEATURES OF WASTEWATER MANAGEMENT ALTERNATIVES FOR THE AREA EAST OF LAKE TARPON

Alternative	
Centralized System with Treatment at Oldsmar WWTP (Cont'd.)	4) Wasteload allocations do not exist for surface waters 5) Increased nutrient/BOD_5 load to Old Tampa Bay could result in water quality degradation 6) Potential public health/recreation impacts with discharge 7) Centralized system would support dense development in area's wetlands, floodprone areas, recharge zones; nonpoint source loads to Lake Tarpon could increase 8) State law and regulations constrain surface water discharges

The alternatives involving discharge into Old Tampa Bay, Clearwater Harbor and St. Joseph Sound can undergo no further screening by EPA at this time. Additional definitive decisions can not be made until wasteload allocations are available.

Existing wastewater management methods east of Lake Tarpon include septic tank - absorption field systems at individual homes and private package plants that serve planned community developments. Wastewater from the package plants is disposed via land application of effluent within that development. With proper maintenance and sufficient acreage, this practice has apparently been successful. Water quality or public health problems associated with these existing systems have not been documented.

The thrust of facilities planning east of Lake Tarpon is toward the provision of facilities for future population, not the existing population. In this regard, the selection of EPA's funding decision is primarily dictated by two factors.

First, the area East of Lake Tarpon contains many sensitive environmental features that could be potentially impacted by continued development. The area is drained by Brooker Creek, a major drainage basin of Lake Tarpon. This tributary system is composed of a network of wetlands and floodplains that comprise 33 percent of the area east of Lake Tarpon. Much of the area is also a groundwater recharge zone which is critical to the long-term viability of the area's groundwater supply. One of the area's major public water supply well fields is located in this portion of the study area. EPA's participation in funding facilities to support development that would adversely affect these sensitive environmental features is limited by both policy and regulation.

Secondly, EPA's Construction Grants Regulations allow the agency to fund facilities only to serve capacity for flows existing on the date of Step 3 grant award, but not to exceed 1990 flows. Since the focus of these alternatives is to serve future development, the Agency's funding role in the area east of Lake Tarpon is limited.

PART D - RECOMMENDATIONS

1) Wastewater Reuse

The wastewater reuse alternatives for each service area are hereby identified as the environmentally preferred disposal alternative. Reuse is the only management option that responds to the area's surface water quality problems while addressing ground water supply limitations. The costs, advantages, and disadvantages should be clearly outlined to the community and local decision makers. The need for a wet weather backup for wastewater that cannot be reused is likely to exist. Potentially feasible backup options include continued but intermittent surface water discharges or deep well injection.

In general terms, the cost of wastewater reuse represents an additional $41 to $48 million beyond the costs associated with surface water disposal options at AWT and secondary treatment levels, respectively for all seven treatment plants. These costs do not recognize any value for the recycled wastewater or the reduced costs associated with lesser needs for potable supplies.

It should be noted that this recommendation is to identify the environmentally preferred alternative, is not necessarily the "fundable" alternative. The "fundable" alternatives for both the Clearwater Harbor - St. Joseph Sound and Old Tampa Bay Subareas will be selected upon completion of the wasteload allocation process. Additionally, identification of the environmentally preferred alternative does not preclude the consideration of other disposal options (e.g., deep well injection). Deep well injection is a disposal option that had been considered as both a primary and backup disposal option. Local agencies may wish to pursue further deep well investigations to determine its feasibility as a disposal option and its relationship to a reuse alternative.

2) Tarpon Springs Subarea

Discharge to the Anclote River of advanced secondary treated (AST) effluent is the recommended alternative for Tarpon Springs, in accordance with the approved wasteload allocation.

3) North Pinellas Subarea

Land application at the existing site and the Innisbrook Country Club has been shown to be the most cost-effective, environmentally sound option available. Regardless of wasteload allocations, land application is the recommended alternative for North Pinellas Subarea.

4) Clearwater Harbor - St. Joseph Sound Subarea

In the absence of wasteload allocations for this sub-area, numerous alternatives remain viable for the Dunedin and Marshall Street service areas. The information from the EIS process will be made available to the state for use in their decisions. Upon completion of the wasteload allocation process, the most cost-effective environmentally sound option for funding eligibility can then be selected.

5) Old Tampa Bay Subarea

In the absence of wasteload allocations for this subarea, numerous alternatives remain viable for the Clearwater East, Clearwater Northeast and Oldsmar service areas. The information from the EIS process will be made available to the state for use in their decisions. Upon completion of the wasteload allocation process, the most cost-effective environmentally sound option for funding eligibility can then be selected.

6) Area East of Lake Tarpon

EPA's policy and regulations concerning funding facilities in environmentally sensitive areas and funding capacity for future flows do not allow funding assistance in the area east of Lake Tarpon. The reasonable alternatives have been evaluated in terms of cost, impact, reliability and implementability. This information is available to the County and private developers for local decision-making.

The U.S. EPA also encourages governing bodies within the Study Area to consider the function and value of environmentally sensitive undeveloped areas east of Lake Tarpon (i.e., groundwater recharge areas, wetlands, floodplains) in future planning and development decisions.

EPA's Construction Grants regulations allow the Agency to fund facilities only to serve capacity for flows existing on the date of Step 3 grant award, but not to exceed 1990 flows. Since the basis for many of the alternatives for the area east of Lake Tarpon is to serve future development, the EPA will not participate in funding wastewater facilities in this area.

7) Gulf Outfall

As part of this EIS, a Marine Measurement and Sampling Program was conducted during 1980 to better define existing environmental and physiographic conditions in the nearshore Gulf of Mexico off northern Pinellas County. The data collected during the sampling program were utilized to assist in evaluating the Gulf outfall wastewater disposal alternative and to generically demonstrate the methodology that should be used in considering a Gulf outfall. See Appendices C and E for additional information on Gulf outfalls. The general findings related to a Gulf outfall from northern Pinellas County are as follows:

- It would provide the area with a reliable long-term wastewater disposal option;
- It would require a major investment of capital in a disposal option that would tend to discourage the environmentally preferred alternative of wastewater reuse;
- It would involve the environmental tradeoffs of minimizing impacts to estuarine waters while increasing impacts to the Gulf (i.e., bottom disruption and community alteration, attractant to fish and other organisms causing impacts, nutrient impact);
- It would remove a development constraint that would potentially promote higher density development and development

in environmentally sensitive areas which are not suitable for on-lot or recycle wastewater management;

- Secondary treatment and disinfection of wastewater would be necessary to minimize adverse impacts of an outfall on local beaches;

- Station 3F which is roughly four miles offshore from Honeymoon Island was selected for additional study to further demonstrate the generic methodology for evaluating the Gulf outfall alternative. The area of Station 3F was found to be less environmentally sensitive than other sites located closer to shore that were evaluated during the Marine Sampling Program;

- Station 3F appears to be more cost effective than other stations evaluated during the Marine Sampling Program based on estimated cost and combined impacts to public health, the St. Joseph Sound estuary and natural hardbottom reef habitat;

- Nearshore Gulf currents vary such that predictions of effluent movement from a discharge are uncertain. Dye discharged in the area of Station 3F during the Marine Sampling Program generally moved in a south-southwesterly direction. A discharge plume in the area of Station 3F would be expected to have minimal impact on the area's beaches;

- Any further consideration of discharge sites near Station 3F should focus on areas slightly north of the exact study location to further minimize potential impacts to usage of the Dunedin Artificial Reef;

- A precise outfall alignment and point of discharge would require additional site-specific analyses (i.e., site specific studies to select the exact outfall route, the discharge point and required mitigation);

- Any further consideration of Station 3F or any other potential Gulf outfall site would be subject to permit/administrative review and approval.

8) Water Conservation

The following conclusions can be stated about water conservation:

- Although evidence of drawdown from pumping is apparent, water appears to be in sufficient quantity to satisfy water supply need. The costs of providing water, however, are higher than costs for water conservation;
- Legal disputes over water rights and inter-county water transfers could intensify. Such disputes have already arisen between Pinellas and Pasco Counties;
- Water conserving devices are easy to install and require little maintenance or operation;
- Losses in water revenue could result from decreased water use;
- Local plumbing codes may require revision; and
- Water conservation measures can generally reduce annual wastewater treatment and disposal costs by 10 percent in developed areas and 15 - 20 percent in less developed areas.

Local governments are encouraged to institute a water conservation program.

NORTH PINELLAS COUNTY, FLORIDA
DRAFT ENVIRONMENTAL IMPACT STATEMENT

TABLE OF CONTENTS

PAGE

EXECUTIVE SUMMARY i
- A. Need for Action i
- B. Development and Evaluation of Alternatives vii
- C. Conclusions xiv
- D. Recommendations xx

TABLE OF CONTENTS xxv

LIST OF TABLES xxvii

LIST OF FIGURES xxviii

GLOSSARY OF TERMS xxix

I. PURPOSE AND NEED FOR ACTION 1

II. ALTERNATIVES DEVELOPMENT AND EVALUATION 9
- A. Background 9
- B. Identification of Available Structural Alternatives 12
- C. Identification of Available Nonstructural Measures 17
- D. Development and Screening of Wastewater Management Alternatives 19
- E. Cost Evaluation 26
- F. Evaluation of Operability and Implementability Factors 35

III. THE AFFECTED ENVIRONMENT, ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES AND MITIGATIVE/ENHANCEMENT MEASURES 41
- A. General Description 41
- B. The Affected Environment 41
- C. Environmental Consequences of the Alternatives 73
- D. Implementation Considerations 84
- E. Mitigative Measures 85

IV. DESCRIPTION OF EPA DECISIONS 91
- A. Basis of Decision 91
- B. EIS Recommendations 92
- C. Remaining Alternatives 98

V. EIS COORDINATION 99

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TABLE OF CONTENTS
(Continued)

PAGE

VI. LIST OF PREPARERS 105

VII. REFERENCES 107

APPENDICES

- A. Environmental Impacts Common to all Alternatives A-1
- B. Threatened and Endangered Species B-1
- C. Marine Sampling and Measurement Program off Northern Pinellas County, Florida C-1
- D. A Preliminary Survey of Meteorological, Hydrographic and Water Quality Conditions in Clearwater Harbor - St. Joseph Sound, Florida D-1
- E. Environmental Impacts Associated with a Gulf Outfall E-1

LIST OF TABLES

Table No.	Table Name	Page
i	Wastewater Service Areas in the North Pinellas County EIS Study Area	v-vi
ii	Implementability, Operability and Environmental Impact Factors of Basic Disposal Options	xv-xvi
iii	Comparative Features of Wastewater Management Alternatives for the Area East of Lake Tarpon	xvii-xviii
1	Wastewater Disposal Alternatives	20-23
2	Present Worth Cost Summary for the Old Tampa Bay Subarea - Least Cost Disposal Alternatives	30
3	Present Worth Cost Summary for the Clearwater Harbor/St. Joseph Sound Subarea - Least Cost Disposal Altenatives	31
4	Present Worth Cost Summary for the North Pinellas (West of Lake Tarpon) and Tarpon Springs Service Areas - Least Cost Disposal Alternatives	32
5	User Charges for the Least Cost Alternatives	34
6	Municipal and County Wastewater Reuse Sites	38
7	Quantities of Wastewater Which Can Be Disposed Via Land Application and Water Reuse	39
8	Vegetation Communities of Northern Pinellas County	53-54
9	Relative Importance of Vegetation Communities	55
10	Potential Environmental Benefits and Concerns with Each Wastewater Disposal Option	75
11	Environmental Projections Associated with North Pinellas County, Florida Coastal Waters	76

LIST OF TABLES

Table No.	Table Name	Page
12	Estimated Distances from an Outfall at Which Water Quality Criteria Can Be Met within the Gulf of Mexico	79
13	Mitigative Measures Associated with Potential Malfunction Events	89
14	North Pinellas County, FL EIS Membership on Advisory Committees	100-101
15	Agency Coordination List	102
B-1	Federally Endangered and Threatened Animals Found in the Pinellas County Area	B-2
B-2	Animals Found in the Pinellas County Area Which are Protected by Florida Laws	B-3
B-3	Plants Found in the Pinellas County Area Which are Protected by Florida Laws	B-5

LIST OF FIGURES

Figure No.	Figure Name	Page
i	EIS Study Area	iii
ii	Municipal Wastewater Service Areas	ix
1	Wastewater Reuse Sites and Distribution Systems	3
2	Shellfish Harvesting Limitations	51
3	Submerged Grass Beds	61
4	Artificial and Natural Reefs	63
5	Wetlands	67
6	Flood Prone Areas	69
7	Aquifer Recharge Areas	71
C-1	Locations of Transects and Sampling Points	C-3

GLOSSARY OF TERMS

AWT - advanced wastewater treatment, as being achieved if the effluent has the following concentrations or lower: 5 mg/l of five-day BOD, 5 mg/l of suspended solids, 3 mg/l of total nitrogen, and 1 mg/l of total phosphorus.

Benthic - associated with the bottom or sediments of an aquatic environment and is normally used in describing bottom-dwelling organisms or communities.

BOD - biochemical oxygen demand or the amount of oxygen required as a result of biochemical reactions such as animal respiration. Normally, BOD is expressed as five-day BOD, or BOD_5, the amount of oxygen biochemical processes consume in a five-day period. As part of the 1980 Gulf Sampling Program, 20-day BOD measurements were made.

EIS - Environmental Impact Statement

EPA - United States Environmental Protection Agency

FDER - Florida Department of Environmental Regulation

MGD - millions of gallons per day

Nitrification - the process by which ammonia is oxidized to nitrate, primarily to reduce the oxygen demand of the treated wastewater.

Secondary Wastewater Treatment - commonly defined as treatment associated with aeration, oxidation and subsequent settling of wastes in addition to primary wastewater treatment. BOD and suspended solids removals average 90 percent as a result of combined primary and secondary treatment. Secondary treatment can include a variety of types of treatment processes: activated sludge, trickling filter, contact-stabilization, lagoon, extended aeration and others. Very little, if any, removal of nitrogen or phosphorus occurs during secondary treatment. The U.S. EPA refers to modified secondary treatment as a train of treatment processes that includes secondary treatment and an additional process such as wastewater filtration.

201 - refers to Section 201 of the Federal Water Pollution Control Act Amendments of 1972 which deals with development and implementation of wastewater management plans. The 201 plans, also called wastewater facilities plans, for North and Central Pinellas County constitute the first step required to obtain federal funds for wastewater collection, treatment and disposal. This EIS study will finalize wastewater management plans and set the stage for detailed design of wastewater management systems.

208 - refers to Section 208 of the Federal Water Pollution Control Act Amendments of 1972 which deals with areawide wastewater management plans. The Tampa Bay Regional Planning Council has prepared a 208 plan, also called an Areawide Water Quality Management Plan, that includes all of Pinellas County as well as Hillsborough, Manatee and Pasco Counties. The 208 plan takes a broader, more regional perspective to wastewater management than 201 plans. Topics considered include institutions involved in wastewater management, nonpoint source pollution problems and other issues that can only be addressed on a regional basis.

Wasteload Allocation - levels of wastewater treatment specified by Florida DER as required before a discharge is allowed to be released. Wasteload allocations are specified for individual rivers, lakes or coastal waters.

WWTP - wastewater treatment plant.

CHAPTER I

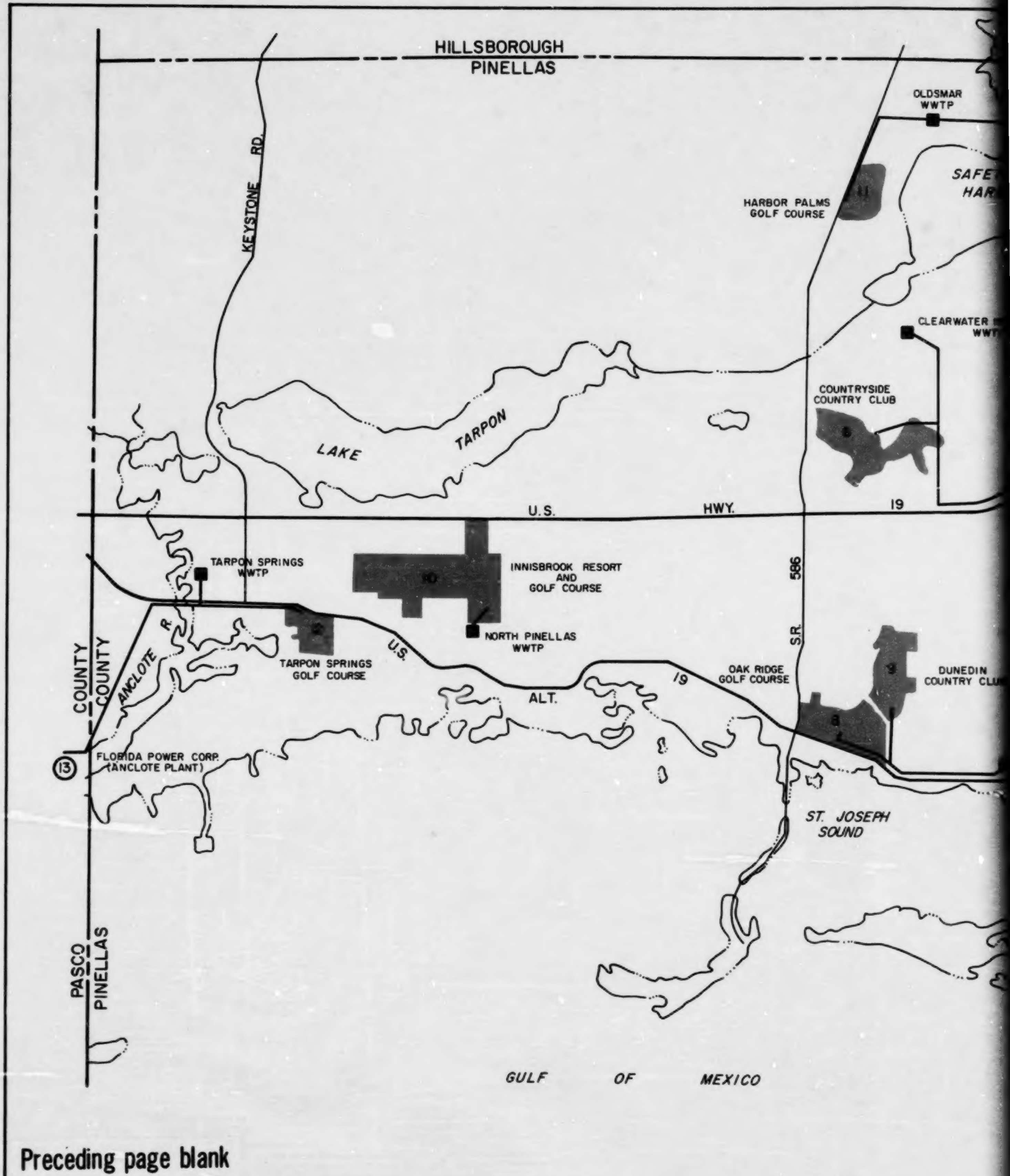
PURPOSE AND NEED FOR ACTION

The North Pinellas County Environmental Impact Statement (EIS) Study Area, shown in Figure 1, has experienced tremendous population growth since the 1950's. Climate and the Gulf coast beaches attract vacationers, seasonal residents, and permanent, year-round residents. Development began south of the Study Area in St. Petersburg and Largo. As those areas became saturated with homes, development began to increase in Clearwater, Dunedin and areas further north. Pinellas County experienced a population growth of 39 percent from 1960 to 1970; it is now one of the most densely populated counties within the state of Florida.

Areas most pleasant for residential and commercial development are often environmentally fragile areas. As a result of being surrounded on three sides by marine or estuarine waters, Pinellas County's fresh groundwater supply is limited. All of the groundwater beneath the southern half of the county is now not potable due to salinity intrusion resulting from excessive pumping. Dispersed wellfields are still utilized in the northern half of the county, but most of these wells have limited yields. Little open space remains for any future development.

Degradation of surface water resources is a second example of the area's environmental sensitivity. Abilities of local coastal waters to assimilate wastewater are limited due to shallow depths, slow flushing rates and pollution from stormwater runoff. Therefore, other ways to dispose of wastewater have been investigated while still desiring to preserve the safe use of local beaches.

Centralized wastewater transmission and treatment systems are managed within the Cities of Clearwater, Dunedin, Oldsmar and Tarpon Springs by the Cities themselves. The City of Clearwater manages three wastewater treatment plants: Clearwater East, adjacent to Old Tampa Bay just off the Courtney Campbell Causeway; Clearwater Northeast which also is proposed to serve the



HILLSBOROUGH
PINELLAS
KEYSTONE RD.
OLDSMAR WWTP
SAFET
HAR
HARBOR PALMS GOLF COURSE
11
CLEARWATER
WWT
COUNTRYSIDE COUNTRY CLUB
6
LAKE TARPON
U.S. HWY. 19
S.R. 586
TARPON SPRINGS WWTP
INNISBROOK RESORT AND GOLF COURSE
10
NORTH PINELLAS WWTP
12
TARPON SPRINGS GOLF COURSE
U.S. 19 ALT.
OAK RIDGE GOLF COURSE
8
9
DUNEDIN COUNTRY CLU
ANCLOTE R.
COUNTY
COUNTY
13
FLORIDA POWER CORP. (ANCLOTE PLANT)
ST. JOSEPH SOUND
PASCO
PINELLAS
GULF OF MEXICO

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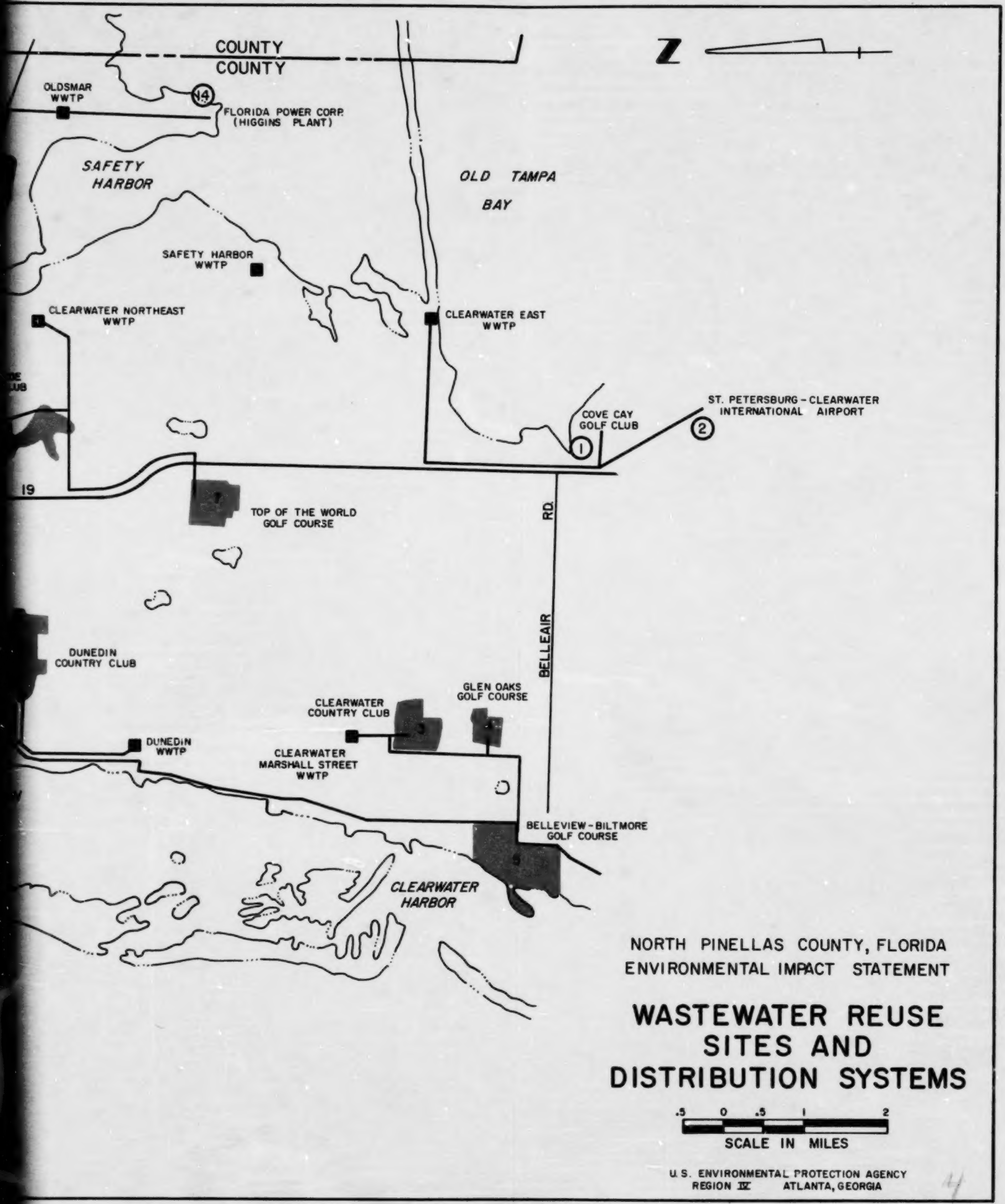
COUNTY
COUNTY
Z
OLDSMAR WWTP
14
FLORIDA POWER CORP. (HIGGINS PLANT)
SAFETY HARBOR
OLD TAMPA BAY
SAFETY HARBOR WWTP
CLEARWATER NORTHEAST WWTP
CLEARWATER EAST WWTP
ST. PETERSBURG - CLEARWATER INTERNATIONAL AIRPORT
COVE CAY GOLF CLUB
1
2
19
TOP OF THE WORLD GOLF COURSE
BELLEAIR RD.
DUNEDIN COUNTRY CLUB
GLEN OAKS GOLF COURSE
CLEARWATER COUNTRY CLUB
DUNEDIN WWTP
CLEARWATER MARSHALL STREET WWTP
BELLEVIEW - BILTMORE GOLF COURSE
CLEARWATER HARBOR
.5 0 .5 1 2
SCALE IN MILES

NORTH PINELLAS COUNTY, FLORIDA
ENVIRONMENTAL IMPACT STATEMENT

WASTEWATER REUSE SITES AND DISTRIBUTION SYSTEMS

U. S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV ATLANTA, GEORGIA

4

FIGURE 1

City of Safety Harbor; and Clearwater Marshall Street which serves the western half of the City of Clearwater. There wastewater service areas are outlined in Figure ii.

The Pinellas County government manages the North Pinellas Wastewater treatment plant and all wastewater transmission lines in unincorporated areas north of the Cities of Dunedin and Clearwater. The area east of Lake Tarpon is not connected to any of the municipal wastewater treatment plants. On-lot systems throughout the Study Area are managed by the Pinellas County Health Department.

The Federal government provided funds for northern Pinellas County for wastewater facilities plans (also called 201 Plans) beginning in the mid-1970's. The North Pinellas County 201 Plan considered areas within the county north of the City of Clearwater: Dunedin, Oldsmar, Tarpon Springs, and unincorporated areas. The Central Pinellas 201 Plan considered the Cities of Clearwater and Safety Harbor and areas further south.

The North Pinellas 201 Plan resulted in a proposed solution to wastewater disposal problems which included the following:

- An outfall to the Gulf of Mexico to dispose of Dunedin's wastewater;
- Spray irrigation to dispose of wastewater from the North Pinellas wastewater treatment plant (WWTP)(serving unincorporated areas west of Lake Tarpon);
- Spray irrigation to dispose of Oldsmar's and Tarpon Spring's wastewater; and
- Conveyance of wastewater from the unincorporated areas east of Lake Tarpon to the Clearwater Northeast WWTP.

Backup (wet-weather) disposal methods for spray irrigation recommended in the North Pinellas 201 Plan were (1) a Gulf outfall for the unincorporated area west of Lake Tarpon and the City of Tarpon Springs and (2) deep-well injection at the Clearwater East WWTP for wastewaters generated in Oldsmar and in the area east of Lake Tarpon. Treatment levels at these wastewater treatment plants were recommended to be secondary or modified secondary (see glossary of terms).

Wastewater disposal methods recommended for the City of Clearwater in the Central Pinellas 201 Plan included:

- o Deep-well injection of effluent from the Clearwater Marshall Street WWTP at a local site;
- o Deep-well injection of effluent from the Clearwater East and Clearwater Northeast service areas at the Clearwater East WWTP; and
- o Routing of untreated wastewater flows from the City of Safety Harbor to the Clearwater Northeast WWTP. The Safety Harbor WWTP was recommended to be abandoned.

Irrigation of publicly-owned lands was recommended in the Central Pinellas 201 Plan as a secondary disposal method. If deep-well injection was to be abandoned, the recommended municipal wastewater disposal system would be a Gulf outfall in conjunction with facilities recommended in the North Pinellas County 201 Plan.

After the 201 Plans were formulated, the U.S. EPA made two important judgements:

- o A Finding of No Significant Impact could not be issued for the Gulf outfall alternative recommended in the 201 Plans; and
- o Questions needed to be addressed regarding wastewater management in less developed portions of the Study Area, particularly the area east of Lake Tarpon, which includes

significant floodplain and wetland areas and two large public wellfields.

The 201 recommendations have been complicated by other events as well. Preliminary deep-well injection field tests conducted during the late 1970s at the Clearwater East WWTP site led to the judgment that continuous injection at that site could not be carried out as recommended in the Central Pinellas 201 Plan without endangering nearby water supply wells. A suitable confining layer(s) was not located during those preliminary drilling activities. Recently, however, the City of Clearwater attempted to acquire funding to reactivate the Clearwater East test site because deep well injection regulation changes may allow for injection at the East site. Attempts to acquire EPA funding have, thus far, not been successful. Deep-well injection testing at the McKay Creek WWTP (located south of the study area) is still continuing.

Secondly, the Florida Department of Environmental Regulation (Florida DER) has not issued final wasteload allocations for Old Tampa Bay, Clearwater Harbor, or St. Joseph Sound. The Florida DER has issued a draft Tampa Bay Water Quality Impact Study which addresses wasteload allocations for Old Tampa Bay as well as for other Tampa Bay waters. This document is currently under review. Wasteload allocations for Clearwater Harbor or St. Joseph Sound have not been established.

An additional factor of concern is that Pinellas County waters have been designated as Outstanding Florida Waters (OFWs) and are afforded additional state protection from the discharge of treated wastewater. The OFW designation and protection is, however, not formally recognized by EPA funding decisions. These waters are also classified as Class II waters (Shellfish Propagation and Harvesting) and as such, the discharge of effluent is not allowed. DER had also established a "no discharge" wasteload allocation for many of these waters in 1978. Because of this allocation, EPA is now denying the reissuance of NPDES permits for facilities with this "no-discharge" allocation. Although DER is currently conducting wasteload allocation studies for many of these waters; the current "no-discharge" allocation, the OFW designation and Class II waters classification provide justification for permit denial.

This North Pinellas County EIS originated in 1979 due primarily to environmental concerns with a Gulf outfall and with wastewater management decisions proposed for the low-lying areas east of Lake Tarpon. No wastewater outfalls extend to the Gulf of Mexico from the Florida coast at the present time. Costs, environmental impacts, operability considerations and implementability factors needed to be addressed. Very little information about the nearshore Gulf Coast environment was available upon which to act on the 201 plan proposals; field data for the Gulf and for Clearwater Harbor - St. Joseph Sound have been collected as part of this EIS process.

CHAPTER II

ALTERNATIVES DEVELOPMENT AND EVALUATION

PART A - BACKGROUND

Wastewater needs are considered in this EIS for northern Pinellas County through the year 2000. All sizes of existing and conceived wastewater facilities are based on wastewater flow projections for the year 2000. Hence costs, impacts and other factors important to evaluating wastewater facilities are based on projected future needs rather than existing needs.

1) Population and Wastewater Flow Projections

Much of the work for this EIS was performed before 1980 census data were available for use. Population projections developed in the late 1970's by the Pinellas County Planning Department for segments of the county are based on U.S. EPA-approved total county projections for the year 2000 for all counties in Florida. These projections show a 79 percent population increase for the EIS study area between 1980 (185,660) and 2000 (333,280). Preliminary draft population projections were obtained from the Pinellas County Planning Council in December 1984. These projections show an 82 percent population increase between 1980 (200,600) and 2000 (364,400). These projections include both permanent and seasonal population.

Population projections used to project wastewater flows are based on population projections utilized in the North Pinellas County 201 Wastewater Facilities Plan (May 1978) and the Central Pinellas County 201 Wastewater Facilities Plan (April 1979). These projections account for seasonal residents and tourists as well as permanent residents.

Projections with water conservation are based on future flow reductions from toilets and showers in new and retrofitted homes (see Part C of this Chapter). These flow reductions can be achieved with little or no homeowner inconvenience and may result in lower water bills for homeowners. Totals of projections for the year 2000 are 43 million gallons of wastewater per day (MGD) without water conservation and 38 MGD with water conservation.

2) Wastewater Treatment and Disposal Facilities

Important facts and projections related to wastewater management in northern Pinellas County include the following:

- Eight municipal wastewater treatment plants (WWTPs) now exist in the study area; only the area east of Lake Tarpon is not now serviced by a municipal WWTP.

- The City of Safety Harbor is projected to be served by the Clearwater Northeast WWTP prior to the year 2000.

- All municipal WWTPs now discharge treated wastewater to coastal waters except the North Pinellas and Oldsmar WWTPs, which utilize land disposal (see Table i in the Executive Summary).

- The only wastewater treatment plants in the study area which are currently interconnected with a wastewater pipeline are the Clearwater East and Clearwater Northeast WWTPs.

- City-owned space at the Clearwater Marshall Street WWTP for additional treatment processes or for injection wells is quite limited (TBRPC, April 1982).

- Effluent from the North Pinellas WWTP is transported to the adjoining Innisbrook Country Club, where it is combined with pond water pumped from wells and sprayed onto golf courses. Innisbrook desires more effluent than the WWTP can provide because the community's lakes are becoming too saline for use.

- Storage ponds at the North Pinellas WWTP and at Innisbrook west of Lake Tarpon can store current flows during wet-weather periods when irrigation is not feasible. Additional storage and a back-up wastewater disposal method may be needed as flows increase in the future.

- The evaporation-percolation ponds utilized to dispose treated wastewater from the Oldsmar WWTP are reported to overflow when the dikes fail resulting in treated wastewater reaching Mobbly Bay.

- Wastewater from the area east of Lake Tarpon is treated at small package WWTPs and discharged via evaporation- percolation ponds or spray irrigation. Impacts associated with wastewater disposed east of Lake Tarpon have not been documented.

- Some violations of secondary treatment requirements were noted at the Safety Harbor and Tarpon Springs WWTPs between October 1978 and October 1979 based on State of Florida secondary treatment requirements (90 percent removal of both five-day biochemical oxygen demand (BOD) and suspended solids).

- Effluent from the Clearwater Marshall Street, Clearwater Northeast, Dunedin, North Pinellas and Oldsmar WWTPs nearly met advanced wastewater treatment requirements for five-day BOD and suspended solids (5 mg/l for each) between October 1978 and October 1979 with secondary treatment processes.

- Expenditures for municipal wastewater management are generally not burdensome except in the Cities of Oldsmar and Tarpon Springs. In Oldsmar, the debt service was nearly four times as large as operation and maintenance (O&M) expenses in 1979.

- Small industrial and private dischargers are scattered throughout the study area, most notably along U.S. Highway 19 and in the unincorporated area west of Lake Tarpon. Total flows of wastewater (in MGD) discharged from these sources are as follows:

	Disposal to Surface Waters	Land Disposal
Industrial	0.0	less than 0.1
Private	0.4	0.3

- Sludge from municipal plants is deposited on pasture lands, city-owned lands or treatment plant grounds. Numerous land owners have requested sludge to be spread on their properties. Sludge from the North Pinellas WWTP has had cadmium levels higher than the maximum level of 5.0 milligrams per kilogram specified in Florida DER regulations and U.S. EPA recommendations. If analyses of sludge continually show such high cadmium levels, the sludge should not be utilized even for the production of animal feed crops.

- On-lot wastewater systems are in use by homeowners and businesses west and northwest of Lake Tarpon and at scattered locations in Clearwater, Dunedin and Tarpon Springs. Elevated sand filters are used by many commercial establishments.

PART B - IDENTIFICATION OF AVAILABLE STRUCTURAL ALTERNATIVES

Structural alternatives are grouped into wastewater transmission systems (for treated and untreated wastewater), wastewater treatment processes, and wastewater disposal methods. Sludge management alternatives are not considered.

1) Wastewater Treatment-Disposal Options for Publicly-Owned Wastewater Treatment Plants

For northern Pinellas County, five basic wastewater disposal options were evaluated; discharge to near shore coastal waters, Gulf outfall, land application, deep-well injection and wastewater reuse.

(a) Discharge to Coastal Waters

This wastewater disposal option is the one currently being implemented by the Cities of Clearwater, Dunedin and Tarpon Springs. Discharges could be released to Old Tampa Bay, Clearwater Harbor, St. Joseph Sound and/or the Anclote River-Estuary.

The possibility of discharging wastewater to Lake Tarpon has been eliminated from consideration. Results of three different methodologies utilized in this EIS for estimating effects of pollutant loadings on lakes predict that Lake Tarpon will become over-enriched with nutrients in the next few years due solely to stormwater runoff. The lake can not accept pollutant loadings from even a small municipal WWTP without adversely affecting current water uses. Lake Tarpon has significant recreational value to citizens of Pinellas County. Runoff control measures, such as porous pavement, have already been instituted near the lake shoreline.

Physical characteristics assumed in this EIS for a discharge to coastal waters are the following: (1) transmission pipeline extending 2,000 feet into a body of water and (2) continuous, year-round wastewater discharge.

(b) Gulf Outfall

General locations from which an outfall could extend into the Gulf of Mexico are Clearwater Beach Island, Honeymoon Island and the Pinellas County coastline north of Honeymoon Island. A number of physical characteristics of a Gulf outfall are important to its comparison with other wastewater disposal options: distance from shore, water depth where wastewater is released and use of a diffuser pipe to enhance wastewater dilution. Effects of currents and blocking effects of an existing wastewater plume near the water surface also need to be considered.

(c) Land Application

Two types of land application are evaluated: slow-rate (two inches of wastewater applied per week on the average) and rapid-rate (twenty inches of wastewater applied per week). Other characteristics are as follows:

	Slow-Rate	Rapid Infiltration
Buffer zones	200 ft.	200 ft.
Underdrains	None	None
Land requirements	200 to 240 acres per MGD of wastewater	40 to 60 acres per MGD of wastewater
Application technique	Spraying or surface application	Surface application
Vegetation	Regularly harvested	Often non-existent
Soils limitations	Possibly significant	More significant than for slow-rate
Method of disposal	Percolation and evapotranspiration	Percolation

Land requirements restrict the feasibility of land application. Only the North Pinellas service area (west of Lake Tarpon) and the Tarpon Springs service area have sufficient, suitable open space to handle wastewater generated from individual service areas, even for the rapid-rate option.

Application of wastewater to wetlands east of Lake Tarpon could also be considered. Because of environmental and hydraulic uncertainties within wetland areas, additional site specific studies would likely be required. Approval from Florida DER would also be needed.

A back-up method of disposal and/or wastewater storage facilities are needed for land application because of wet-weather land disposal limitations. Potentially feasible back-up options include continued but intermittent surface water discharges or deep well injection.

(d) Deep-Well Injection

With this wastewater disposal option, wastewater is pumped into a geological formation via a disposal well. Florida DER requirements for deep-well injection are (1) that the aquifer has high enough transmissivity and storage capability to allow injection to be conducted with reasonable pumping costs, (2) that the aquifer receiving wastewater should have at least 10,000 mg/l of dissolved solids and be separated from potable groundwater preferably by two geologic confining layers (3) that the aquifer be injected with treated wastewater for a 28 month test period.

A number of uncertainties exist with this disposal option. Any of these uncertainties can greatly affect estimated costs: (1) number of test wells required; (2) site-specific geology; and (3) depth for injecting wastewater. Significant funds are needed to conduct injection tests which determine the feasibility of deep-well injection at a selected site. If the selected site is unsuited, a decision whether to undertake tests at a second site is required.

Deep-well injection has been conducted in the testing mode at various WWTPs south of the Study Area in the City of St. Petersburg and also at the McKay Creek WWTP in Largo. Some test results at the St. Petersburg Southwest WWTP have been interpreted and reported by Hickey (1982). Higher-than-expected well head pressures were observed during a 91-day test conducted during 1977. Hickey (1982) reports for the first 12 months of a 32 month test that pressure build up varied. These tests were conducted with injection of approximately 3.5 MGD of treated wastewater.

Currently, the status of deep wells in southern Pinellas County are as follows: (1) wells at the St. Petersburg Southwest WWTP are approved and operating, (2) wells at the McKay Creek (Largo) South Cross Bayou, and St. Petersburg Northeast WWTPs are being tested based on Florida DER long-term testing requirements, (3) wells at the St. Petersburg Northwest WWTP are now being installed, and (4) wells at the Albert Whitted WWTP will not be utilized; effluent from that WWTP will be transferred to McKay Creek.

(e) Community-Wide Water Reuse

This disposal option is very similar to rapid-rate land application; the primary difference is that parks or golf courses receive wastewater with the system operating 50 percent of the available time. Unlike for land application, land is utilized for another purpose in addition to wastewater disposal. However, landowners of golf courses need to be cooperative and utilize wastewater regularly with a great deal of dependability. Incentive is available for landowner cooperation in the form of reduced needs for water from potable ground water supplies.

Treated wastewater is now being reused in the City of St. Petersburg at parks, golf courses and schoolyards. Individual property owners can also be connected to this reuse system if a treated wastewater pipeline is nearby and if the property owners pay hook-up fees. This system in St. Petersburg was largely funded by the U.S. EPA as an innovative wastewater management system.

Reuse at individual homes, businesses and subdivisions was not considered in this study for northern Pinellas County for the purpose of preliminary cost and available land estimates. The inclusion of the community elements must, however, consider operation and maintenance needs, public health concerns should a system malfunction, and costs.

Just as with land application, both a back-up method of wastewater disposal and storage of wastewater are required, particularly for use during periods of wet weather. Potentially feasibile back-up options include continued but intermittent surface water discharges or deep well injection.

2) On-Lot and Small Community Wastewater Systems

A number of different types of technologies are evaluated for serving areas not connected to a public sewer system. A septic tank preceding either a soil absorption field or a sand mound is by far the most widely utilized type of on-site system. Extended aeration preceding irrigation or lagoons is the most widely utilized type of small community system.

Discharge of treated wastewater to the nearest freshwater stream or lake from a small community is eliminated from consideration for northern Pinellas County due to inability of these waters to accept wastewaters without significant adverse water quality impacts (see Chapter III discussion). Many of these waters are utilized for recreation as well.

PART C - IDENTIFICATION OF AVAILABLE NONSTRUCTURAL MEASURES

Nonstructural measures include a variety of regulatory, administrative, and educational procedures that can be used to enhance structural water quality control. The principal focus of nonstructural alternatives is their use in supporting and supplementing structural alternatives and solutions by reducing construction and operation-maintenance needs.

1) Water Conservation and Flow Reduction

Water supply is becoming an increasingly critical concern in the North Pinellas study area with increasing reliance on wellfields outside the County. The benefits of water conservation and flow reduction techniques can include relieving any overloaded treatment and collection facilities, reducing the capacity required for new facilities or eliminating the need for expansion of existing facilities.

Several nonstructural measures are available and can be used within the study area for reducing water use and wastewater flow. They include:

- Plumbing code implementation and enforcement;
- Educational programs; and
- Water and wastewater pricing.

Plumbing codes can be the most effective regulatory means of implementing the use of flow reduction plumbing fixtures in all future developments and wherever replacements fixtures are needed. The following are examples of amendments to plumbing codes that might be considered for flow reduction purposes.

- Tank-type toilets to be of a design that provides a maximum flush not to exceed 3.5 gallons. This would reduce water flow from toilets by 30 to 50 percent.
- Water-saving shower heads to limit flow to a maximum of 3 to 3.5 gallons a minute. Presently, most showers have flow rates of six gallons per minute.
- Water-saving faucets to limit flow to a maximum of three gallons a minute with self-closing devices on faucets at commercial or industrial establishments.
- Installation or pressure-reducing valves for all water lines where the incoming water pressure is expected to exceed 60 pounds per square inch (psi).

Citizen education programs, if pursued, can have a beneficial effect and can be approached in two stages. Public advertising alerts the citizens to the issue. Water companies and/or municipalities can then provide low cost water conservation kits to interested citizenry.

Water rates can be modified to encourage water conservation. Under one technique, water charges are kept at a uniform price per gallon until consumption reaches a certain level, when a higher price rate is specified for consumption within the next level or block and so on.

Projections, assuming water conservation measures are implemented at new and renovated homes within North Pinellas County, indicate a reduction in wastewater flow of approximately 11 percent is achievable with water-saving toilets and shower heads.

The State of Florida is also encouraging water conservation. In September of 1983, a law was passed by the Florida legislature requiring water-saving fixtures in new and renovated homes.

2) Land Use and Development Controls

Development controls are used to influence the type, pattern, and overall density of development. Controls can also be used to limit or prohibit development in areas which have been determined as unsuitable, such as floodplains and wetlands. When coupled with a formal capital improvements plan, development controls can be used to guide development to areas which can be efficiently served by public utilities, thus avoiding untimely and costly utilities expansion and potential environmental problems. The area east of Lake Tarpon has the greatest potential for the application of innovative development controls.

3) Wastewater Management Districts

Improper installation and maintenance is often cited as a problem with on-lot systems. Package plants and small community systems similar to the type in use east of Lake Tarpon often suffer from improper operation and maintenance. Management of on-lot and/or small community systems can be accomplished either through establishment of a separate local management agency or expansion of the responsibilities and funds allocated to an existing local agency. Implementation and administration funds would come from user charges, general revenues, or other traditional public funding sources.

PART D - DEVELOPMENT AND SCREENING OF WASTEWATER MANAGEMENT ALTERNATIVES

Wastewater transmission, treatment and disposal options presented in Part B of this chapter can be combined into wastewater management alternatives. A range of individual, sub-regional and regional alternatives were established for the Study Area. Reasonable wastewater management alternatives are presented in Table 1.

TABLE 1
WASTEWATER DISPOSAL ALTERNATIVES

Designation	Alternative
Individual Alternatives	
City of Clearwater East (E) Service Area	
E-1(1)	Continue existing discharge to Old Tampa Bay south of the Courtney Campbell Causeway
E-2(1)	Discharge to Old Tampa Bay at different location south of Causeway
E-3	Discharge to Old Tampa Bay north of Causeway
E-17(1)	Distribution of reusable wastewater to parks, golf courses and other lands for nonpotable uses
City of Clearwater Marshall Street (MS) Service Area	
MS-1(1)	Continue existing discharge to Stevenson Creek
MS-2	Discharge to Clearwater Harbor
MS-3	Discharge via outfall to Gulf of Mexico extending from Clearwater Beach Island
MS-17(1)	Distribution of reusable wastewater to parks, golf courses and other lands for nonpotable uses
City of Clearwater Northeast (NE) Service Area	
NE-1(1)	Resume former discharge which flows into Possum Branch (and subsequently to Old Tampa Bay)
NE-2	Discharge directly to Possum Branch
NE-3	Discharge to Safety Harbor
NE-4	Discharge to Old Tampa Bay north of Causeway
NE-16(1)	Discharge of reusable wastewater to parks, golf courses and other lands for nonpotable uses.
City of Dunedin (D) Service Area	
D-1(1)	Continue existing discharge to St. Joseph Sound
D-2	Relocate discharge to some other location in St. Joseph Sound

TABLE 1
(Cont'd.)

Designation	Alternative
City of Dunedin (D) Service Area (cont'd.)	
D-3	Discharge via outfall to Gulf of Mexico extending from Honeymoon Island
D-15(1)	Distribution of reusable wastewater to parks, golf courses and other lands for nonpotable uses.
North Pinellas (NP) Service Area	
NP-1	Discharge to St. Joseph Sound
NP-2	Discharge via outfall to Gulf of Mexico extending from Gulf coast north of Honeymoon Island
NP-4(1)	Discharge to Anclote River
NP-15(1)	Apply wastewater to sites within the county including sites now receiving effluent (land application)
NP-19(1)	Distribution of reusable wastewater to parks, golf courses and other lands for nonpotable uses
City of Oldsmar (O) Service Area	
O-1(1)	Discharge to Safety Harbor
O-2	Discharge to Mobbly Bay
O-3	Discharge the Old Tampa Bay north of Courtney Campbell Causeway
O-5	Combine with Higgins Power Plant cooling water and effluent prior to discharge to Old Tampa Bay
O-18(1)	Distribution of reusable wastewater to parks, golf courses and other lands for nonpotable uses
City of Tarpon Springs (TS) Service Area	
TS-1(1)	Continue existing discharge to Anclote River
TS-2	Discharge via outfall to Gulf of Mexico extending from Gulf coast north of Honeymoon Island
TS-4	Discharge to St. Joseph Sound
TS-5(1)	Discharge to different location within Anclote River

TABLE 1
(Cont'd.)

Designation	Alternative
City of Tarpon Springs (TS) Service Area (cont'd.)	
TS-6	Combine with Anclote Power Plant cooling water and effluent prior to discharge to Gulf of Mexico
TS-14(1)	Apply wastewater to sites within the county (land application)
TS-19(1)	Distribution of reusable wastewater to parks, golf courses and other lands for nonpotable uses
Area East of Lake Tarpon	
	Various systems for individual establishments
	Sub-division systems with land application at golf courses
	Interceptor connecting to the Oldsmar wastewater treatment plant
	Interceptor connecting to the Tarpon Springs treatment plant
Sub-Regional Alternatives	
Sub-Reg. 1(1)	Discharge to Old Tampa Bay south of Courtney Campbell Causeway from the Clearwater East, Clearwater Northeast and Oldsmar WWTPs (wastewater treatment plants)
Sub-Reg. 2	Discharge to Old Tampa Bay north of the Courtney Campbell Causeway from the Clearwater East, Clearwater Northeast and Oldsmar WWTPs
Sub-Reg. 3	Discharge to Clearwater Harbor south of the Memorial Causeway from the Clearwater Marshall Street and Dunedin WWTPs
Sub-Reg. 4	Discharge to Clearwater Harbor south of the Dunedin Causeway from the Clearwater Marshall Street and Dunedin WWTPs
Sub-Reg. 5	Discharge to St. Joseph Sound north of the Dunedin Causeway from the Clearwater Marshall Street and Dunedin WWTPs
Sub-Reg. 6	Discharge to St. Joseph Sound north of the Dunedin Causeway from the North Pinellas and Tarpon Springs WWTPs

TABLE 1
(Cont'd.)

Designation	Alternative
Sub-Reg. 7(1)	Discharge to Anclote River from the North Pinellas and Tarpon Springs WWTPs
Sub-Reg. 8	Discharge via outfall to Gulf of Mexico extending from Gulf coast north of Honeymoon Island. Discharges would be treated at the North Pinellas and Tarpon Springs WWTPs
Sub-Reg. 9(1)	Discharge via outfall to Gulf of Mexico extending from Honeymoon Island. Discharges would be treated at the Clearwater Marshall Street and Dunedin WWTPs
Sub-Reg. 10(1)	Same as Sub-Reg. 9 except discharges to be disposed would be treated at the Clearwater Marshall Street, Dunedin, North Pinellas and Tarpon Springs WWTPs
Sub-Reg. 11(1)	Same as Sub-Reg. 9 except that the outfall would extend from Clearwater Beach Island
Sub-Reg. 12(1)	Deep-well injection at or south of the Clearwater Marshall Street WWTP. Discharges would be treated at the Clearwater Marshall Street and Dunedin WWTPs.
Sub-Reg. 13(1)	Same as Sub-Reg. 12 (deep-well injection) except wastewaters from the Clearwater East and Clearwater Northeast WWTPs would be disposed.
Regional Alternatives	
Reg. 1	Discharge to Old Tampa Bay, south of Courtney Campbell Causeway
Reg. 2	Discharge to St. Joseph Sound south of Dunedin Causeway
Reg. 3	Discharge to St. Joseph Sound north of Dunedin Causeway at southern end of Tarpon Springs
Reg. 4(1)	Gulf outfall extending from Honeymoon Island
Reg. 5(1)	Gulf outfall extending from Clearwater Beach Island
Reg. 6(1)	Deep-well injection at or south of the Clearwater Marshall Street WWTP

(1) Alternatives that are evaluated in detail.

1) Northern Pinellas County Wastewater Service Areas

A number of the wastewater management alternatives listed in Table 1 are eliminated from further consideration because of high costs, excessive adverse impacts on the environment, excessive operational or implementation problems or because of a combination of these factors. Those alternatives shown in Table 1 which were not eliminated in this section are evaluated in remaining portions of Chapter II.

The alternatives that are eliminated from consideration because they are clearly less preferred from an environmental or cost standpoint or because they are not reasonably implementable are as follows:

Type of Wastewater Management Alternative Eliminated	Basis for Elimination From Further Consideration
Discharge of wastewater to non-tidal creeks and to Lake Tarpon	Inability to accept treated wastewater without significant adverse environmental impacts
Deep-well injection in areas with an insufficient confining layer of clay or other impermeable material.	Concern regarding potential impacts on potable ground water supplies (basis for State of Florida and Federal injection rules)
Land application, except for effluent from the North Pinellas WWTP west of Lake Tarpon	Land area with suitable soil and geology characteristics not available even for rapid-rate land application
Evaporation-percolation ponds as the only method of wastewater disposal for a wastewater service area	Land area not available based on verticle hydraulic conductivity of silty sand

Alternatives which are significantly more costly are not warranted unless significantly more favorable environmental impacts and/or significantly enhanced operation and implementation are predicted. Many of the alternatives eliminated here from consideration are judged to be incapable of enhancing environmental conditions, operation or implementation enough to warrant the projected additional costs.

2) Area East of Lake Tarpon

Pinellas County Planning Department projections note that significant development is expected to occur in this low-lying area (Pinellas County Planning Department, 1978). Basic difficulties with such development that are associated with wastewater management are the following:

- Discharges of wastewater to Lake Tarpon are not recommended, as discussed in Part B of this Chapter, in light of recreational usage of the lake and the lake's inability to accept significant quantities of treated wastewater without adverse environmental impacts.

- Adequate depths of unsaturated, permeable soils are not generally available to accept treated wastewater disposed via on-lot for individual homes or land application of wastewater from all package treatment plants.

Lined lagoons are not feasible, because evapotranspiration does not exceed inputs from precipitation and upstream runoff. Sewers from the area east of Lake Tarpon connected to any treatment plant other than either the Oldsmar WWTP or the Tarpon Springs WWTP would be costly or result in operational concerns. Also, an existing agreement between the Pinellas County Sewer System and the City of Oldsmar would make implementation more difficult for any alternative not comforming to that agreement. This agreement establishes service area boundaries.

Alternatives evaluated in detail for the area east of Lake Tarpon are the following:

- Septic tank-sand mound systems at individual homes (and businesses);

- Land application (or wastewater reuse) for sewered subdivisions;

- Provide sewers which connect to the Oldsmar WWTP, except perhaps for the northernmost area east of Lake Tarpon which could possibly be connected to the Tarpon Springs WWTP.

PART E - COST EVALUATION

1) Procedure and Assumptions

Two types of cost estimates are most relevant to consider (1) net present worths and (2) total annual costs.

Net present worth is the value of capital at time zero needed to cover capital, operation and maintenance costs through the entire planning period (through the year 2000 for this project) and salvage values at the end of the planning period, all based on a specified interest rate. A net present worth is a single dollar amount which includes all of the various types of costs encountered for each wastewater management alternative.

Total annual costs cover capital, operation and maintenance costs for the planning period assuming all capital costs are paid uniformly with interest during a specified amortization period.

The costs presented in this EIS are estimates which can be considered accurate for late 1980 to within plus or minus 20 percent. The amount of any future Federal grant would not be based solely on the cost estimates presented in this study. More detailed cost estimates would need to be developed once the recommended alternative is established and design work is ready to begin.

Various assumptions have been incorporated into these cost estimates:

- Costs are based on materials and equipment costs, labor rates and other costs pertinent for the fourth quarter of 1980. These cost estimates were developed during the first half of 1981. For purposes of comparing alternatives, the cost estimates remain useful. However, 1980 costs and costs at the present time differ due to inflation and other factors.

- To reflect costs in the Southeastern United States, cost indices for Atlanta, GA are have been utilized from the Engineering News-Record (ENR) and from U.S. EPA publications. Atlanta is the city closest to Pinellas County for which cost indices are available.

- Construction of facilities was assumed to take place in 1984.

- The interest rate used to calculate 1981 present worth costs is 7.375 percent as given in the Federal Register dated October 22, 1980. As of October 1984, the Federal discount rate had risen to 8.375 percent.

- A 25-year amortization period has been assumed in order to pay back loans for capital costs.

- Costs incurred prior to 1981 are "sunken costs" which have not been included with present worth costs.

- Contingency costs for design, taxes and legal fees have been assumed to be 15 percent of construction costs for system expansions and 30 percent of construction costs for new systems.

- Advanced wastewater treatment costs include costs for secondary (activated sludge) treatment, filtration, nitrogen removal via ammonia stripping, and phosphorus removal via two-stage lime addition.

- Costs for regional alternatives include wastewater service for the area east of Lake Tarpon as well as costs to serve the other wastewater service areas. These costs are proportioned to each service area based on projected year 2000 wastewater flows.

Costs for sludge management are not included.

2) Costing Conclusions

As expected, those alternatives with the least extensive physical facilities are the least-cost alternatives for each service area. If supplemental wastewater treatment facilities can be avoided, if transmission pipelines are short in length, and if disposal facilities are neither extensive nor complex, then costs can be kept low. Supplemental treatment and transmission can be costly even if Federal Construction Grant funding is to be provided.

Specific conclusions regarding these cost estimates are as follows:

- Costs for effluent piping and pumping are the prime contributions to high disposal costs - at times making disposal costs higher than treatment costs.
- The Gulf outfall alternatives are more costly than most of the other surface water discharge alternatives. Costs for burying an outfall (approximately $1,500/foot of 60-inch pipe) have been estimated to be approximately twice the costs for an unburied outfall (approximate $750/foot of 60-inch pipe).
- For individual service areas the least-cost alternatives, are those that provide minimum (secondary) treatment and discharge to the adjacent surface water except for the unincorporated area west of Lake Tarpon served by the North Pinellas plant (where rapid infiltration and use of the Innisbrook Country Club is least costly).

- Estimated annual costs to individual cities or to Pinellas County for wastewater management range from a low of $741,000 for Oldsmar (alternative O-1 with secondary treatment) to a high of $2.7 million for Clearwater Marshall Street (alternative MS-3 with secondary treatment plus filtration), assuming Federal funding is to be provided.

- Estimated costs for regional deep-well injection are quite speculative, but they are estimated to be higher than costs for all but the most costly regional Gulf outfall options.

- Sub-regional and regional alternatives can be particularly costly, because long lengths of wastewater pipelines are included to connect the various wastewater treatment plants.

- Water conservation can generally reduce annual wastewater treatment and disposal costs by 10 percent in Clearwater East and other urban-suburban service areas and by 15 to 20 percent in undeveloped areas.

Net present worths for the least cost disposal options for each of the service areas are presented in Tables 2, 3, and 4.

Net present worth costs (for the fourth quarter of 1980) for groups of alternatives are summarized as follows:

All discharges are released to nearby waters and receive secondary treatment (except AST for Tarpon Springs and land application for North Pinellas)	$ 48 million
All discharges are released to nearby waters and receive advanced treatment	

TABLE 2

PRESENT WORTH COST SUMMARY FOR THE OLD TAMPA BAY SUBAREA - LEAST COST DISPOSAL ALTERNATIVES

Discharge To Lower Old Tampa Bay With:	Discharge to Upper Old Tampa Bay With:		
	Secondary Treatment	Advanced Treatment	No Discharge
Secondary Treatment	Oldsmar to Upper Old Tampa Bay NE to Upper Old Tampa Bay E to Lower Old Tampa Bay $14.5 million (1)	Oldsmar to Upper Old T.B. NE + E to Lower Old Tampa Bay $22.2 million (3)	O+NE+E to Lower Old Tampa Bay $34.2 million (6)
	Oldsmar to Upper Old Tampa Bay NE + E to Lower Old Tampa Bay $20.1 million (2)	Oldsmar to Upper Old T.B. NE to Upper Old T. B. E to Lower Old Tampa Bay $24.6 million (4)	
Advanced Treatment	UNLIKELY	Oldsmar to Upper Old T.B. NE to Upper Old Tampa B. E to Lower Old Tampa Bay $30.9 million (5)	O+NE+E to Lower Old T.B. $50.4 million (9)
No Discharge	UNLIKELY	UNLIKELY	Regional Gulf Outfall $36.7 million (7)
			Regional Deep Well Injection 38.1 million (8)

NOTES:

- E refers to the Clearwater East discharge; NE refers to the Clearwater Northeast discharge.
- Upper Old Tampa Bay refers to the portion of the Bay north of the Courtney Campbell Causeway.
- For reuse, add $20.5 to $23.5 million to the cost of the disposal alternatives.
- The parenthetical numbers are the cost ranking of the alternatives (1 having the lowest cost).
- Ultimate discharge locations could significantly affect these costs.
- These are 4th quarter 1980 costs which do not include effects of water conservation.
- The blocks listed as "unlikely" are based on current water quality conditions (e.g., the fact that water quality in Upper Old Tampa Bay is poorer than in Lower Old Tampa Bay and treatment levels in Lower Old Tampa Bay are unlikely to be more stringent than treatment levels in Upper Old Tampa Bay).

TABLE 3

PRESENT WORTH COST SUMMARY FOR THE CLEARWATER HARBOR/ST. JOSEPH SOUND/ SUBAREA - LEAST COST DISPOSAL ALTERNATIVES

Discharge to Clearwater Harbor With:	Discharge to St. Joseph Sound With:		
	Secondary Treatment	Advanced Treatment	No Discharge
Secondary Treatment	Dunedin to St. Joseph Sound Marshall St. to Clearwater Harbor $18 million (1)	Dunedin to St. Joseph Sound Marshall St. to Clearwater Harbor $25.1 million (2)	UNLIKELY
Advanced Treatment	Dunedin to St. Joseph Sound Marshall St. to Clearwater Harbor $26.7 million (3)	Dunedin to St. Joseph Sound Marshall St. to Clearwater Harbor $33.8 million (4)	UNLIKELY
No Discharge	UNLIKELY	UNLIKELY	Dunedin + Marshall Street - Deep Well Injection $38.5 million (5) Regional Gulf Outfall $39.6 million (6) Regional Deep Well Injection $41.2 million (7) Dunedin + Marshall Street - Gulf Outfall $50.6 million (8)

NOTES.

- For reuse, add $13.3 to $17.1 million to the cost of the disposal alternatives.
- The parenthetical numbers are the cost ranking of the alternatives (1 having the lowest cost).
- Discharge locations could affect these costs.
- These are 4th quarter 1980 costs which do not include effects of water conservation.
- Costs for the regional alternatives are costs to only the Clearwater Marshall Street and Dunedin service areas (based on equal distribution amongst current households).

TABLE 4

PRESENT WORTH COST SUMMARY FOR THE NORTH PINELLAS (WEST OF LAKE TARPON) AND TARPON SPRINGS SERVICE AREAS - LEAST COST DISPOSAL ALTERNATIVES

Discharge to Anclote River With:	Discharge to St. Joseph Sound With:		
	Secondary Treatment	Advanced Treatment	No Discharge
Secondary Treatment	NP to St. Joseph Sound TS to Anclote River $17.2 million (2)	NP to St. Joseph Sound TS to Anclote River $22.0 million (5)	NP to Rapid Infiltration and Use of Innisbrook TS to Anclote River $14.7 million (1)
Advanced Treatment	NP to St. Joseph Sound TS to Anclote River $21.9 million (4)	NP to St. Joseph Sound TS to Anclote River $26.7 million (6)	NP to Rapid Infiltration TS to Anclote River $19.4 million (3)
No Discharge	UNLIKELY	UNLIKELY	UNLIKELY

NOTES:

- o Only the lowest cost alternatives are presented here.
- o NP refers to the North Pinellas discharge; TS refers to the Tarpon Spring discharge.
- o The parenthetical numbers are the cost ranking of the alternatives (1 having the lowest cost).
- o Ultimate discharge locations could significantly affect these costs.
- o These are 4th quarter 1980 costs which do not include effects of water conservation.
- o Slow-rate land application of effluent from the North Pinellas (west of Lake Tarpon) service area is $5.5 million more costly than rapid infiltration of the same effluent.

	(except AST for Tarpon Springs and land application for North Pinellas)	$ 86 million
o	All discharges are reused so much as possible and receive secondary treatment plus filtration (not including cost savings in using recycled water)	$ 96 million
o	Regional Gulf outfall	$101 million
o	Regional deep-well injection	$105 million
o	All discharges are reused and receive advanced treatment (not including cost savings in using recycled water)	$121 million

Annual user charges to existing households needed to fund the implementation of any alternative can be quite high as shown in Table 5, particularly if Federal funding is not to be provided. These user charges could be economically burdensome for homeowners to afford, particularly in the Clearwater Northeast, North Pinellas and Oldsmar service areas where existing homeowners would be supporting facilities for future development.

While estimated costs are quite important to the process of evaluating alternatives, the U.S. EPA does not wish to imply that the least-cost alternatives are actually the recommended alternatives for every wastewater service area. Environmental impacts, operational needs and implementation requirements are considered essential in the process of selecting recommended or preferred alternatives.

Total annual costs east of Lake Tarpon have been estimated for the various alternatives. The costs for the on-site and small community systems are based on an analysis of three large planned residential communities east of Lake Tarpon. Alternatives involving the Tarpon Springs WWTP or a new WWTP have both been eliminated because of high costs. On-site septic tank-sand mound systems were determined not to be implementable on a large scale because of unsuitable soils.

TABLE 5

USER CHARGES[(1)] FOR THE LEAST COST ALTERNATIVES

Service Area	Alternative[(2)]	Annual User Charge Estimated For Each Existing Household: With 75 Percent Construction Grant Funding	Annual User Charge Estimated For Each Existing Household: Without Construction Grant Funding
Clearwater East	Discharge to Lower Old Tampa Bay with secondary treatment	$ 36	$ 37
Clearwater Northeast	Discharge to Lower Old Tampa Bay with secondary treatment	$282	$318
Clearwater Marshall Street	Discharge to Stevenson Creek (Clearwater Harbor) with secondary treatment	$ 44	$ 44
Dunedin	Discharge to St. Joseph Sound with secondary treatment	$ 74	$111
Oldsmar	Discharge to Safety Harbor with secondary treatment	$173	$248
North Pinellas	Land application at Innisbrook Country Club	$330	$459
Tarpon Springs	Discharge to Anclote River	$ 99	$159

(1) These charges are only for wastewater facilities being evaluated in this EIS. Most interceptors and all smaller collector pipes are not included.

(2) See Table 1 for full description of Alternative.

Treatment Alternatives	Annual User Cost to Existing Households (4th Quarter 1980 Costs)
Community sand mound-septic tank effluent pump system	$386
Land application following secondary treatment (package plants)	$393
Centralized system with treatment at Oldsmar WWTP	$400

The costs of the centralized system do not include disposal costs. With the addition of the disposal costs, the centralized system is more costly than the two remaining small community systems.

PART F - EVALUATION OF OPERABILITY AND IMPLEMENTABILITY FACTORS

The factors of operability and implementability are two important facets of wastewater management alternatives. These facets need to be evaluated together with costs (Part E of this Chapter) and environmental impacts (Chapter III).

Key issues are:

- Complex environmental conditions which can not be assessed quantitatively thereby resulting in uncertainties about the effectiveness of particular alternatives (primarily Gulf outfall and deep-well injection alternatives);
- Effects of state and local regulations including Federal Construction Grant funding regulations;
- Affordability of alternatives both with and without Federal funding;
- Operation of land application and water reuse alternatives during wet-weather periods; and

- Land availability for land application and water reuse systems.

Key conclusions from assessing the operability and implementability considerations are as follows:

- The most significant operability concerns for each surface water discharge alternative are achieving desired levels of wastewater treatment prior to discharge. These levels are, however, unknown pending completion of the wasteload allocation process.

- Other significant operability-implementability concerns are: (1) land availability for land application; (2) questionable acceptance by the public or any regulatory agency of a regional or sub-regional Gulf outfall in light of the uncertain likelihood that discharged effluent would adversely affect barrier island beaches; (3) necessary arrangements among cities and Pinellas County for implementing sub-regional or regional alternatives; and (4) affording the high costs for most of the alternatives.

- The Cities of Oldsmar and Tarpon Springs have the most difficulty in affording costly wastewater disposal alternatives, based on the financial status of these cities.

- Funding from the Federal Construction Grants program can not be utilized for most future development.

- Implementation of water conservation measures would not pose major significant operability or implementability concerns.

Achieving advanced levels of wastewater treatment is not straightforward, even if the wastewater treatment facilities are well designed and properly installed. Operators are preferred that are both: (1) experienced with the recommended unconventional nitrogen and phosphorus removal processes and (2) available to devote time and effort of operation and maintenance of these processes. The need to avoid bypassing of effluent away from treatment units is paramount in a coastal area with significant tourism such as Pinellas County.

Since most of northern Pinellas County is currently served by municipal or county collection systems and treatment facilities, reuse would involve upgrading treatment, if necessary, distributing treated effluent, and reusing the effluent at a suitable location. Parks, golf courses, industries, power plants and other disposal sites are located within a few miles of all of North Pinellas County's municipal treatment facilities. A listing of some of the possible disposal sites and treatment plants is shown on Table 6. The sites and distribution systems are shown on Figure 1.

From information in Table 7, either land application or wastewater reuse on parks, golf courses, etc. could not be utilized to dispose all wastewater from the Cities of Clearwater, Dunedin and Oldsmar and from the area east of Lake Tarpon. Excessive wastewater application rates would result in ponding and perhaps runoff of treated wastewater loading to public health concerns. It is important to note that other possible reuse sites such as other open lands, residential lands, etc. have not been included in this screening of reuse sites.

Difficulty in affording proper wastewater management stems from the fact that the study area supports a large number of people together with a sensitive natural environment. Furthermore, many study area residents are retired and therefore living on relatively fixed incomes. Much of the county's incoming capital is from tourism. Hence, the question of who is to pay for wastewater management and how the costs are to be allocated is a significant issue. Sub-regional or regional alternatives could result in particular difficulty with developing an allocation of costs agreeable to all involved. The Cities of Oldsmar and Tarpon Springs have the most pressing financial situations within the study area at the present time.

TABLE 6

MUNICIPAL AND COUNTY WASTEWATER REUSE SITES

Service Area	Reuse Site (1)
Clearwater East	1. Cove Cay Golf Club (90 Acres)
	2. St. Petersburg/Clearwater Airport
Clearwater Marshall Street	3. Clearwater Country Club (95 Acres)
	4. Glen Oaks Country Club (29 Acres)
	5. Belleview Baltimore Golf Course (140 Acres)
Clearwater Northeast	6. Countryside Country Club (172 Acres)
	7. Top of the World Golf Course (81 Acres)
Dunedin	8. Oak Ridge Golf Center (42 Acres)
	9. Dunedin Country Club (100 Acres)
North Pinellas	10. Innisbrook Resort and Golf Courses (450 Acres)
Oldsmar	11. Harbor Palms Golf Course (35 Acres)
Tarpon Springs	12. Tarpon Springs Golf Course (123 Acres)

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(1) Site numbers correspond to numbers for each site presented on Figure 1.

TABLE 7

QUANTITIES OF WASTEWATER WHICH CAN BE DISPOSED VIA LAND APPLICATION AND WATER REUSE

	Percentages of Average, Year 2000 Wastewater Flows Disposable at Nearby Sites for Two Rates of Wastewater Application	
Service Area	Slow-rate (2 inches per week)	Rapid-rate and Water Reuse (20 inches per week)
Clearwater East	5	40
Clearwater Marshall Street	10	38
Clearwater Northeast	less than 10	34
Dunedin	less than 10	30
North Pinellas (area west of Lake Tarpon)	100 (4 sites)	100
Oldsmar	10 to 15	43
Tarpon Springs	100 (9 sites)	43
Area East of Lake Tarpon	0	0

Notes:

- Acreage requirements include buffer zones, storage reservoirs, access roads, and other facilities not directly useable for disposing treated wastewater. Sizes of buffer zones are based on EPA requirements.
- Useable sites are considered to be parks and golf courses with adequate subsurface water permeability and unsaturated soil depth and do not include residential lands or other open lands.

The thrust of facilities planning in northern Pinellas County is toward the provision of facilities for future population, not the existing population. In this regard, the selection of EPA's funding decision is affected by two major factors.

First, EPA's participation in funding facilities that would support development in sensitive environmental areas is limited by both policy and regulation. Second, EPA's Construction Grants Regulations allow the Agency to fund facilities only to serve capacity for flows existing on the date of Step 3 grant award, but not to exceed 1990 flows.

Operation and implementation of water-conserving toilets and shower heads should not pose significant problems. These devices are relatively inexpensive to install and maintenance free. Within five to ten years, water-conserving devices could pay for themselves in the form of reduced water bills. Drawdown of water levels at wellfields would also be reduced.

CHAPTER III

THE AFFECTED ENVIRONMENT: ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES AND MITIGATIVE MEASURES

PART A - GENERAL DESCRIPTION

A number of comments about the methods utilized in this EIS to evaluate environmental impacts are worth noting:

- Wastewater loadings of five-day biochemical oxygen demand (BOD) and total nitrogen have been compared to other sources of pollution (other WWTPs, industries, runoff during and following storm events);
- Impacts have been described qualitatively together with some quantitative assessment as considered useful given the complex coastal water hydrology;
- Quantitative estimates of wastewater diluted upon discharge to the Gulf of Mexico have been developed and evaluated;
- Technical uncertainties have not been rigorously quantified; and
- Ease and effectiveness of mitigative or enhancement measures have been evaluated.

PART B - THE AFFECTED ENVIRONMENT

The physical features of Pinellas County that attract both people and industry are also environmentally sensitive features. The very characteristics that attract people to Pinellas County are those that are most vulnerable to human activity. A continuous influx of permanent and seasonal residents and tourists since the 1950's has stimulated the local economy but at the same time jeopardized the County's sensitive water and land resources resulting in:

- Prohibition of shellfishing in coastal waters;
- Blooms of benthic algae and phytoplankton reducing dissolved oxygen levels and causing undesirable odors in the local waters, particularly in Old Tampa Bay;
- Development on barrier islands that has interrupted the natural littoral drift of sand by seawall and jetty construction. This activity only makes the impacts of hurricane waves more severe as less sand exists to dissipate wave energy;
- Ground water supplies in much of Pinellas County are saline and are no longer suitable for potable use. Water for the County is pumped from wells in neighboring counties; and
- Less abundant sport fish and wildlife in the County.

Beach use along the Gulf coast and sport fishing in the Gulf remain as popular recreational activities.

1) Surface Water Resources

Coastal waters which have been evaluated for the possibility of receiving treated municipal wastewater are Old Tampa Bay east of the Study Area, Clearwater Harbor - St. Joseph Sound west of the Study Area, the Anclote River-Estuary which flows from east to west through the City of Tarpon Springs, and the Gulf of Mexico.

(a) Old Tampa Bay

- The portions of Old Tampa Bay being considered for wastewater disposal are essentially two distinct water bodies: Old Tampa Bay north of the Courtney Campbell Causeway, and Old Tampa Bay south of the Courtney Campbell Causeway (north of the W. Howard Frankland Bridge - see Figure 1).

- Flushing in Old Tampa Bay north of the W. Howard Frankland Bridge is slow due to both the presence of the Courtney Campbell Causeway and the small volumes of fresh water entering the Bay from upstream land areas, particularly during the drier months between November and May. Detention times of water in various parts of the Bay can vary from 5 to 20 months.

- Tides, winds and land configurations control the complex water movements within Old Tampa Bay. However, waters flow basically from north to south due to flows from upstream.

- Water quality data for Old Tampa Bay are available on a regular monthly basis since 1972 from the Hillsborough County Environmental Protection Commission.

- Average dissolved oxygen concentrations have remained above 7.0 milligrams per liter (mg/l). However, dissolved oxygen concentrations have not been measured in the early morning when such concentrations are usually lower than at any other portion of a day.

- Phosphorus concentrations were measured monthly from 1974 to 1980 in the Bay. Noted levels of 0.66 to 0.76 mg/l of phosphorus are well in excess of levels needed for phytoplankton growth.

o Yearly blooms of benthic algae (Ulva sp. and Gracilaria sp.) contribute to localized water quality and odor problems adjacent to the Clearwater East and Safety Harbor Wastewater Treatment Plant (WWTP) discharges.

(b) Clearwater Harbor - St. Joseph Sound

o The two portions of Clearwater Harbor - St. Joseph Sound considered for wastewater disposal are those north and south of the Dunedin Causeway. Waters south of the Dunedin Causeway are largely confined by barrier islands.

o South of the Dunedin Causeway, total nitrogen and total phosphorus concentrations measured in 1978, 1979 and 1981 frequently exceeded levels considered necessary for phytoplankton growth. Phosphorus and nitrogen concentrations tend to be greater south of the Dunedin Causeway than to the north.

o North of the Dunedin Causeway, total nitrogen and total phosphorus concentrations measured in 1978, 1979 and 1981 did not often exceed the levels considered necessary for phytoplankton growth.

o Slow flushing of water in Clearwater Harbor - St. Joseph Sound is due to the presence of barrier islands and two causeways as well as being due to the small volumes of fresh water entering the harbor-sound, particularly during the drier months of the year.

o Water movements in the harbor-sound are regulated by tides, winds and the passes between barrier islands. As with Old Tampa Bay, water movements are complex and unpredictable. Waters flow basically from east to west; waters north of the Dunedin Causeway are assumed in this EIS to be minimally affected by waters south of the Dunedin Causeway and vice versa.

- Water quality data for Clearwater Harbor - St. Joseph Sound are very limited. Monthly data are available for 1978 and 1979 from the Pinellas County Department of Environmental Management.

- Growths of Ulva sp. are progressing northward from the southern portions of the water body. Declines in the growth of marine grassbeds south of the Dunedin Causeway are at least partially the result of algae shading the grasses, according to the 1974 Pinellas County Surface Water Assessment. Suspended sediments from runoff and dredge spoils could also contribute to the decline in marine grassbed growth.

- Of all the confined coastal waters being considered for effluent disposal, St. Joseph Sound north of the Dunedin Causeway is the least polluted. The portion of the Sound north of the Dunedin Causeway is better flushed by waters from the Gulf. In addition, nutrient criteria have not been exceeded and no unacceptably-low dissolved oxygen levels have been measured.

The Clearwater Harbor - St. Joseph Sound one-day sampling program conducted in February 1981 by the Mote Marine Laboratory as part of this EIS provided the following conclusions:

- Tides, winds, fresh water inflows and topographic features, such as passes, all influence water movements. Influences of the various creeks were evident within the harbor-sound.

- Water quality characteristics did not include any dominant trends with time during a tidal cycle or with location.

One day of measurements can not provide conclusions appropriate to explain long-term characteristics. Additional information on this preliminary survey is included in Appendix D.

(c) Anclote River-Estuary

- The Anclote system is a river-estuary whose saline zone extends upstream from the Gulf of Mexico approximately four miles to Salt Lake. The non-saline zones are north of the study area in Pasco County.
- Water movements in the Anclote River-Estuary are regulated primarily by tides, winds, upstream flows, and land configurations. The numerous bayous and interconnected streams that constitute the river-estuary make water movements quite variable and unpredictable.
- Water quality data for the Anclote River-Estuary are limited to monthly data at one station, short-term surveys conducted from 1976 to 1978 (monthly data) and intensive two-day surveys conducted during November 1977 and September 1978.
- Upstream waters are acidic and low in dissolved oxygen due primarily to numerous wetland areas within the Anclote basin.
- Nitrogen and phosphorus concentrations in the river fluctuate greatly over time.

(d) The Gulf of Mexico

A Marine Sampling Program was conducted as part of the EIS to collect data to develop a Gulf outfall alternative for wastewater disposal to consider along with other disposal alternatives. The Marine Sampling Program was also designed to generically demonstrate the evaluation methodology that should be used in considering a Gulf outfall. The sampling program was conducted by the Mote Marine Laboratory in the Gulf of Mexico from May 27 to June 2, 1980 and from October 13 to November 4, 1980. This sampling program resulted in physical, chemical, and biological data for the Gulf from Belleair Causeway (south of Clearwater) to Anclote Key (northwest of Tarpon Springs) and from 0 to 10 miles offshore. The most significant conclusions from the Gulf sampling program which relate to wastewater management are the following:

- Water movements in the Gulf of Mexico are controlled by tides, winds, land configurations and, to a lesser extent, by Loop Current eddies.
- Water depths did not exceed 45 feet as far as 10 miles from shore. Depths four miles from shore are approximately 30 feet.
- "Patch reefs" (hard-bottom and limestone outcroppings) were evident interspaced with extensive sand and shelly sand areas. A lateral transect off Anclote Key contained more extensive coarse shell areas than the other transects to the south. A transect off the Belleair Causeway contained the highest percentage of hard bottom area.
- Water movements were varied and unpredictable at different locations and at different depths. Currents during falling tides (generally toward the south) ran faster than the weak northerly currents during rising tides. Currents leaving inlets headed west at relatively high speed. Winds during the sampling efforts were primarily from the east and northeast (May-June) and from the northwest to northeast (October-November).

- Gulf waters were well-mixed vertically. No unusual water quality trends were noted. The influence of the Anclote River on the Gulf appeared to be minimal. Densities of coliform bacteria, indicators of human contamination, were extremely low and well below standards for recreation and shellfish.

- Various bottom substrates provide habitat for a wide variety of aquatic life forms.

- Aquatic species were diverse and numerous. Seasonal variations in types of organisms were also observed.

- Nearshore sediments near Honeymoon Island contained a higher percentage of silt-clay and organic enrichment than sediments near Belleair Causeway and Anclote Key.

Generally, the sampling program showed no unusual results except possibly the diversity of aquatic life and the complexity of water movements. Aquatic life diversity often indicates sensitivity to changing environmental conditions. Complex water movements make predictions of impacts from a possible Gulf outfall on Gulf beaches very uncertain.

Appendix C gives more information about the Gulf sampling program. Overall, the Gulf sampling program did not indicate any pollution except within approximately one mile of the western shore of Honeymoon Island (U.S. EPA, 1982a and b).

2) Public Health

Public contact with bacteria, viruses and other microorganisms from wastewater is the primary public health concern in this EIS. Current public health conditions relevant to wastewater management are presented in this section.

- Beaches at Oldsmar, Safety Harbor, and along the Courtney Campbell Causeway crossing Old Tampa Bay are not major tourist beaches but instead are used primarily by local residents. Extensive water contact can occur during weekends.

- Shellfishing within Old Tampa Bay and St. Joseph Sound is limited. In Old Tampa Bay, several areas are currently closed to shellfishing, several are approved but closed and the remaining areas are unclassified (and unapproved). In St. Joseph Sound, the area east of northern Caladesi Island is closed while all other areas are unclassified. Figure 2 presents these shellfish harvesting areas (Florida Department of Natural Resources, no date).

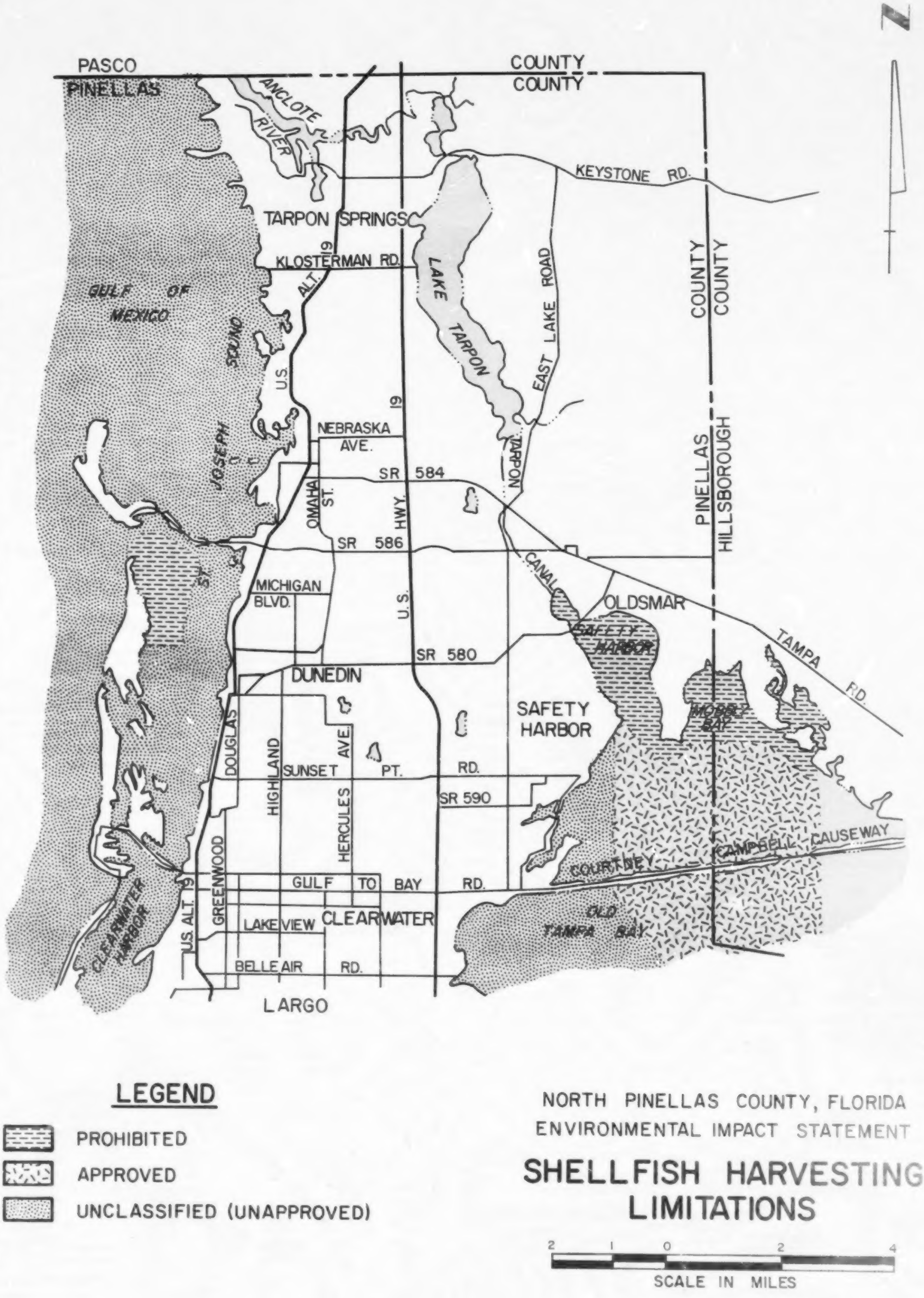
- High bacteria counts have been detected at the mouths of Stevenson and Curlew Creeks which discharge to Clearwater Harbor - St. Joseph Sound south of the Dunedin Causeway (Pinellas County Environmental Task Force, 1974).

- Mainland beaches along the county's west coast are small when compared with the barrier island beaches. These beaches are scattered along the peninsula's western shoreline north of the Dunedin Causeway.

- Pollution-intolerant shellfish are present within St. Joseph Sound north of the Dunedin Causeway.

- The Anclote River-Estuary is closed to water contact sports such as swimming because of continually high bacteria counts potentially due to urban runoff, marina discharges and discharges from the Tarpon Springs WWTP.

- The beach at Brooker Creek Park along the southeastern shore of Lake Tarpon is periodically closed to swimming during peak summer weekends. The Pinellas County Health


N
PASCO COUNTY
PINELLAS COUNTY
ANCLOTE RIVER
KEYSTONE RD.
TARPON SPRINGS
KLOSTERMAN RD.
ALT. 19
U.S.
LAKE TARPON
EAST LAKE ROAD
PINELLAS COUNTY
HILLSBOROUGH COUNTY
GULF OF MEXICO
ST. JOSEPH SOUND
NEBRASKA AVE.
19
SR 584
OMAHA ST.
HWY.
TARPON
SR 586
CANAL
MICHIGAN BLVD.
U.S.
OLDSMAR
SAFETY HARBOR
TAMPA RD.
SR 580
DUNEDIN
MOBBLY BAY
SAFETY HARBOR
DOUGLAS
HIGHLAND
AVE.
SUNSET PT. RD.
HERCULES
SR 590
COURTNEY CAMPBELL CAUSEWAY
GREENWOOD
US ALT. 19
GULF TO BAY RD.
CLEARWATER HARBOR
LAKE VIEW
CLEARWATER
OLD TAMPA BAY
BELLE AIR RD.
LARGO
LEGEND
PROHIBITED
APPROVED
UNCLASSIFIED (UNAPPROVED)
2 1 0 2 4
SCALE IN MILES

NORTH PINELLAS COUNTY, FLORIDA
ENVIRONMENTAL IMPACT STATEMENT

SHELLFISH HARVESTING LIMITATIONS

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV ATLANTA, GEORGIA

FIGURE 2

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Department monitors coliform levels at the beach regularly. Concerns about the lake are related to the effects of nonpoint pollution sources.

- No water quality problems have been documented as a result of small community wastewater systems being operated east of Lake Tarpon.

- Normally, red time blooms occur within the Gulf of Mexico off the St. Petersburg coast and move southward. In 1980, however, a red tide bloom originated 10 to 40 miles off shore north of the Study Area.

- The Pinellas County Health Department is responsible for on-lot wastewater systems within both incorporated and unincorporated portions of the county. The budget of the county health department limits its efforts to regularly inspect on-lot systems.

3) Biological Resources

Ten terrestrial plant communities listed in Table 8 are recognized within Pinellas County and are generally most extensive in the northern portion of the Study Area, particularly the area east of Lake Tarpon. Table 9 indicates the relative importance of each vegetation.

TABLE 8

VEGETATION COMMUNITIES OF NORTHERN PINELLAS COUNTY

Types	General Locations
Sandhills	Upland Ridges
Pine flatwoods	Level uplands and lowlands
Upland hardwoods	Uplands
Fields	Uplands: old fields, pastures, agricultural areas
Beaches	Coastal barrier islands
Cypress swamps	Lowlands and upland depressions
Hardwood swamps	Lowlands and upland depressions

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TABLE 8 (Cont'd.)

Types	General Locations
Freshwater swamps	Lowlands
Saltmarshes	Coastal lowlands
Mangrove swamps	Coastal lowlands

Birds are the most abundant animal type in the Study Area with more than 200 identified species. Mammals are well represented with 39 species while reptiles and amphibians are represented by 48 and 20 species respectively. These animals include 34 species listed as endangered, threatened or rare by the State of Florida. In addition, seven species of protected plants are known to exist in Pinellas County. As shown in Table 9, valuable wildlife and plant habitat is found in the cypress and hardwood swamps, freshwater and salt marshes, and the mangrove swamps, all of which are located predominantly east of Lake Tarpon.

Fisheries within the study area are an important renewable natural resource. Over 95 percent of the local commercial and sport fish species are dependent on the adjacent coastal environments, such as estuaries, saltmarshes and mangroves. Freshwater habitats in the area are likewise affected by adjoining wetland communities, such as freshwater marshes and swamps, and by runoff from nearby uplands.

Commercial fish landings are by far the largest and most valuable segment of the fisheries resource. Landings of Pinellas County fishermen were the fourth highest of all Florida counties in 1976. In 1976, the National Marine Fisheries Service reported that 7.7 million pounds of fish and shellfish worth over $5.5 million were harvested in the entire Pinellas County area.

Commercial fisheries for oysters were formerly much more significant in the Pinellas County area. For instance, 80,620 pounds of oyster meats were landed in Pinellas County in 1963. However, the degradation of estuarine water quality in recent years has led to the complete termination of commercial oyster fishing. Commercial scallop fishing has been inconsistent and highly variable.

TABLE 9

RELATIVE IMPORTANCE OF VEGETATION COMMUNITIES(1)

● HIGH VALUE OR EXTENT
◐ MODERATE VALUE OR EXTENT
○ LOW VALUE OR EXTENT

COMMUNITY TYPES	WILDLIFE HABITAT	ENVIRONMENTAL HEALTH		BUFFER CAPACITY	FLOOD CONTROL	RECREATION	DEVELOPMENT [illegible]ITABILITY	EXTENT WITHIN STUDY AREA
		POLLUTION ASSIMILATION	AIR & NOISE POLLUTION ABATEMENT	(STORM PROTECTION)	(SOIL RETENTION CAPABILITY AND DETENTION TIME)			
SANDHILLS	○	◐	●	●	○	○	●	◐
PINE FLATWOODS	◐	●	●	◐	◐	◐	◐	●
UPLAND HARDWOODS	●	●	●	◐	◐	◐	◐	○
FIELDS	◐	◐	○	○	○	○	●	●
BEACHES	○	○	○	◐	○	●	○	○
CYPRESS SWAMPS	●	●	●	●	●	◐	○	●
HARDWOOD SWAMPS	●	●	●	●	●	◐	○	●
FRESHWATER MARSHES	●	●	○	○	●	◐	○	○
SALTMARSHES	●	●	○	◐	○	◐	○	○
MANGROVE SWAMPS	●	●	◐	●	○	◐	○	○

(1) Table adapted from Planning/Design Group (1976). Clearwater Environmental Management Program and Conservation Plan.

4) Population and Land Use

As discussed in the introductory background section, Pinellas County is one of the most populous counties in Florida as well as one of the fastest growing. Seasonal population is estimated to be approximately 9 percent of the county's permanent population. The relatively undeveloped areas adjacent to Lake Tarpon are projected to have the greatest percentage increase in population during the next 20 years. Population projections are discussed in Part A of Chapter II.

Projected changes in land use involve the conversion of undeveloped and agricultural land to residential developments. Future land use allocations prepared by the Pinellas County Planning Department indicate low-density and medium-density residential land will occupy approximately 70 percent of the EIS Study Area. Existing land use estimates completed in 1979 for the Study Area are as follows:

	Percent
Residential	25
Commercial	4
Industrial	1
Agricultural	14
Open Space	8
Vacant	44
Public/Semi-public	2
Utilities/Transportation	2
	100

East of Lake Tarpon, six major subdivisions have been or are in the process of being constructed with a total current wastewater handling capacity of approximately 650,000 gallons per day (Pinellas County Sewer System, 1984). The developers have had few, if any, problems obtaining any required ordinances or permits. As this development intensified, the County water system purchased a tract of land west of their wellfield which is north of State Route 582 and a tract near the Pinellas County - Hillsborough County border east of Lake Tarpon.

5) Community Services and Facilities

Water supply is becoming an increasingly critical concern in the Pinellas County area. Water is supplied to Pinellas County residents from groundwater sources located in northeastern Pinellas County, in Pasco County and within the Cities of Clearwater, Dunedin and Tarpon Springs. Plans project that water sources north of Pasco County may need to be utilized by the year 2000.

Wastewater management in the Study Area is not affected by solid waste disposal practices within Pinellas County.

Recreation areas and parks, including private golf courses, offer the potential for land application facilities. Private golf courses in the Study Area occupy a total of approximately 2,000 acres, nearly 40 percent of the land allotted for all park and recreational areas. Several golf courses in the Study Area already use treated wastewater for irrigation, particularly the Innisbrook Country Club west of Lake Tarpon and a number of golf courses in the area east of Lake Tarpon.

6) Groundwater Resources

Wastewater can be disposed onto land via land application, deep-well injection, or water reuse at parks or golf courses. All potable water for the Study Area comes from groundwater both within and outside the Study Area. Groundwater resource characteristics presented here are important to dual usage of the local geologic strata for both wastewater disposal and water supply.

The Floridan Aquifer from which water supplies are extracted is separated from the water table by a confining layer. The depth of this confining layer is less than fifty (50) feet throughout most of the EIS Study Area, with the exception of the southwestern portion at and south of the Clearwater Marshall Street WWTP. South of the Study Area, the depth of the confining layer exceeds 50 feet.

Saltwater intrusion in the Floridan aquifer is occurring in Pinellas County at a rate of 0.3 to 0.4 feet per year (Reichenbough, 1972). Saline waters advance inland from the west and south in response to heavy pumping of freshwater in the northeastern part of the County and adjacent wellfields in Pasco County. Many wells close to the coastline have been abandoned.

Shallow dispersed wellfields within the Cities of Clearwater and Dunedin are still used for portions of the cities' water supply needs. The Eldridge-Wilde and East Lake wellfields northeast of Lake Tarpon are the only other location of potable water supply within the County.

The water table aquifer is separated from the Floridan Aquifer, the major water supply source, by a layer of impervious clay. This clay layer is occasionally perforated by sinkholes through which surface waters can enter the Floridan Aquifer.

Current land application of wastewater at the Innisbrook Country Club west of Lake Tarpon has not been shown to be adversely impacting potable water supplies.

Most soils in the EIS Study Area are sandy and strongly acidic, have a low natural fertility, and frequently exhibit thin claypans. Well-drained and moderately well-drained soils are located in the northwestern part of the county from Palm Harbor north to Tarpon Springs, on the Pinellas Ridge in the central part of the county, and on most of the barrier beaches. Poorly drained soils are found throughout the Study Area in areas of low elevation where claypans and low elevations keep the water table near the surface. Swamp and muck soils are found primarily in the tidal inundation areas and in areas east of Lake Tarpon (USDA, 1972).

7) Archaeological and Historical Resources

Numerous properties in Pinellas County have been designated as historically significant; however, only four structures have been listed on the National Register of Historic Places. The Pinellas County Planning Department has identified 56 properties of historic interest in northern Pinellas County, including the four listed on the National Register. The existing National Register sites are: the Phillippe Plantation and Indian Mound (Safety Harbor), Tarpon Springs Sponge Exchange, Andrews Memorial Chapel (Dunedin), and Safford House (Tarpon Springs).

8) Economics and Employment

The economy and employment base of the northern Pinellas County area is dominated by tourism. The mild climate and extensive beaches from Clearwater to Tarpon Springs is the major tourist attraction in the EIS Study Area. Over 3.6 million visitors spent $1,240 million during 1978. Tourism has created unusually high demand for employment in retail trade and services. Nearly 121,000 jobs in 1977, approximately 52 percent of the employment in Pinellas County, was in the retail trade and services sector. Within the Study Area, only beaches on Clearwater Beach Island are intensely utilized by tourists.

Industry and manufacturing is a minor part of the Pinellas County economy but has continued to expand at least through 1980. Manufacturing employment comprised 13 percent of the total employment in 1979.

Per capita income figures and the source of income are important considerations when evaluating projected user fees and the population's ability to pay for wastewater treatment and disposal improvements. The relatively low 1979 per capita income in Pinellas County of $6,970 is related to retail trade and service employment and the large retirement population. Approximately one-fourth of all personal income within Pinellas County is derived from dividends, interest on accounts, rent receipts and other types of investment income.

9) Environmentally Sensitive Areas

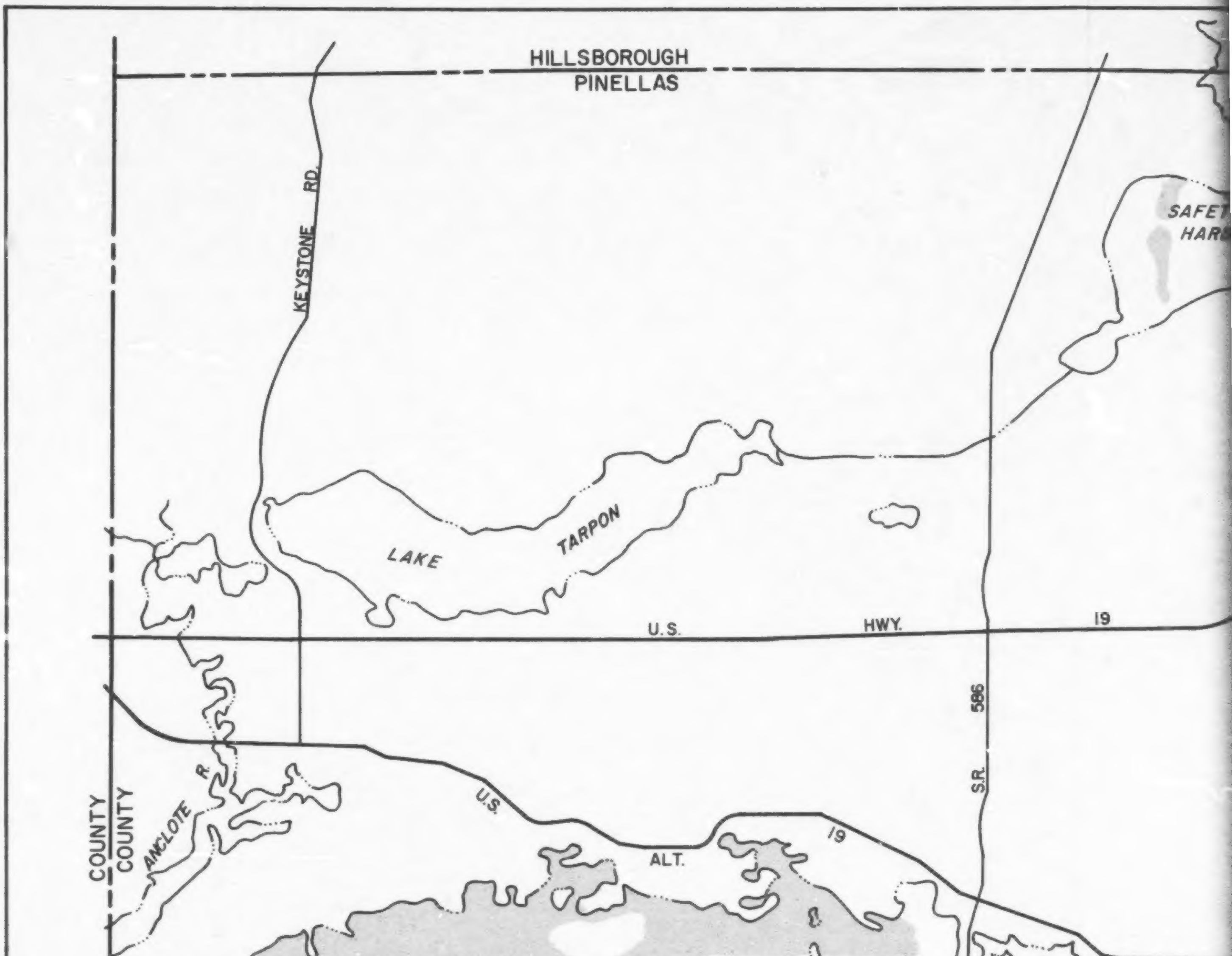
Environmentally sensitive areas in northern Pinellas County can be classified as coastal features and inland features. Coastal sensitive areas include: Class II (shellfish harvesting) waters, marine grassbeds, coastal reefs, saltmarshes, mangroves, barrier islands, and beaches. All coastal waters of Pinellas County are designated as Outstanding Florida Waters. Inland sensitive areas include: freshwater marshes and swamps, floodplains, aquifer recharge areas, springs, sinks and lakes (Lake Tarpon). Most inland sensitive areas are located in the northern portion of the Study Area adjacent to Lake Tarpon. Coastal and inland sensitive areas in Pinellas County support a variety of threatened and endangered plants and animals.

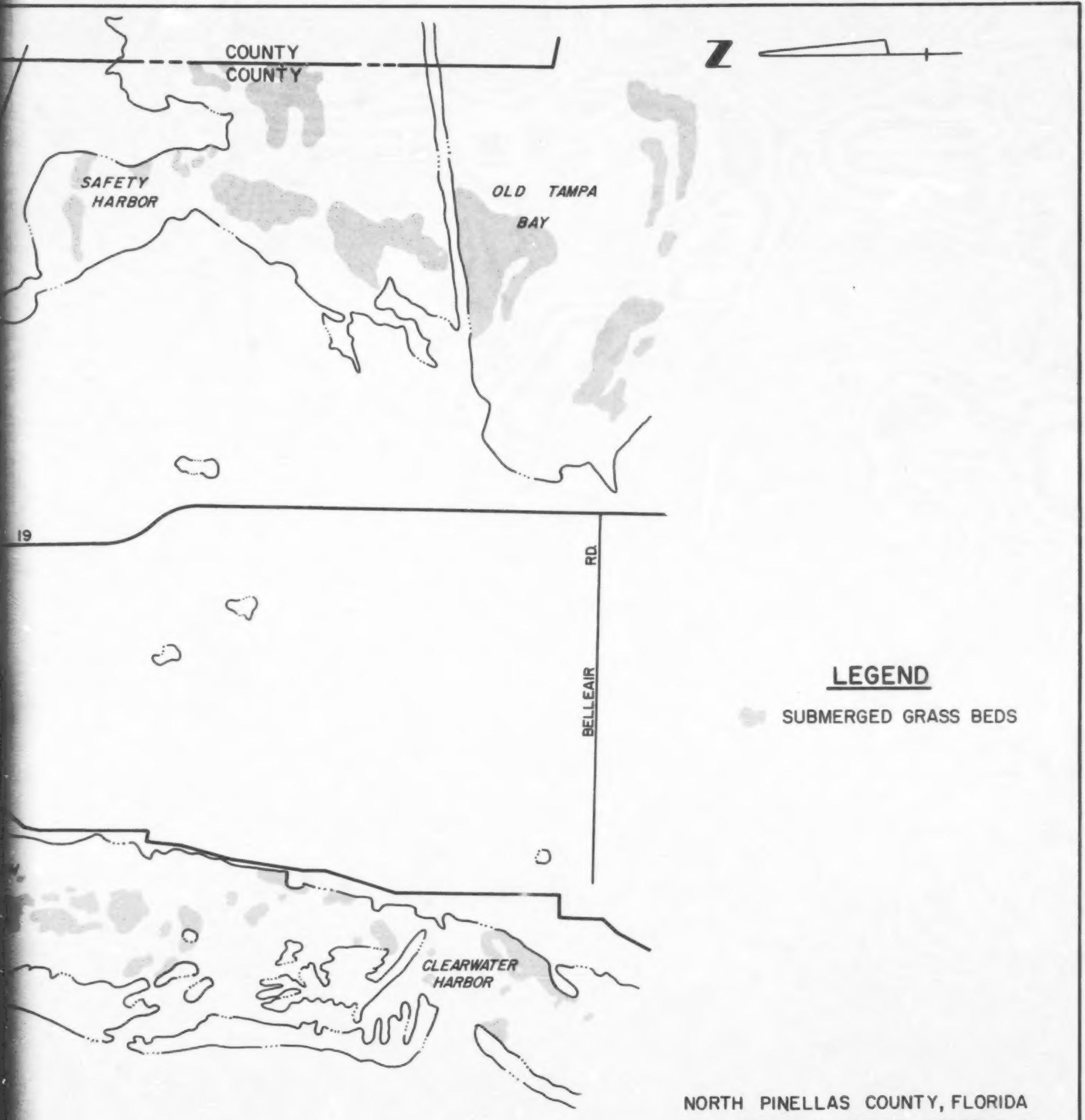
Class II waters are those waters designated to support or potentially support shellfish harvesting. Because of the high water quality standards required for these areas, they are more vulnerable to water quality standards violations due to pollution from urban runoff and wastewater discharges. Class II waters in the Study Area include Mobbly Bay, Old Tampa Bay and Safety Harbor.

Marine grassbeds significantly contribute to the marine ecology of the study area by stabilizing bottom sediments and providing food and habitat for a variety of marine organisms. The high productivity of these communities is enhanced by an abundance of various life forms which help support a large and widespread food web. Marine grassbeds are extensive from northern Clearwater Harbor through St. Joseph Sound and into the Anclote Anchorage. Submerged grassbeds are shown on Figure 3.

Natural and artificial coastal reefs in the Gulf of Mexico provide cover and habitat to many marine organisms and are vital to the local commercial and sport fishing industries. Natural reef areas are composed of small, intermixed patches of limestone outcrops and sand and shell substrates. These areas are extensive but patchy in local Gulf waters. Artificial reefs are significant. Four areas of natural and artificial reefs are in close proximity to the Study Area: Tarpon Springs Reef, Dunedin Reef, Clearwater Reef, and Rube Allyn Reef. Artificial and natural reefs are shown on Figure 4.

Saltmarshes and mangrove swamps provide an interface between marine and terrestrial ecosystems and are used as food sources and habitats for both marine and terrestrial organisms. The largest expanses of saltmarshes occur in the extreme northern portion of Pinellas County adjacent to the Anclote River. Within the Study Area, mangrove swamps are limited in their extent but widely scattered along the coastlines, barrier islands and estuaries often integrated with saltmarshes. Mangrove swamps and saltmarshes, in addition to their


HILLSBOROUGH
PINELLAS
KEYSTONE RD.
SAFET
HAR
LAKE TARPON
U.S. HWY. 19
S.R. 586
U.S. 19 ALT.
ANCLOTE R.
PASCO COUNTY
PINELLAS COUNTY
ST. JOSEPH SOUND
GULF OF MEXICO


COUNTY
COUNTY
SAFETY HARBOR
OLD TAMPA BAY
19
BELLEAIR RD.
CLEARWATER HARBOR
LEGEND
▨ SUBMERGED GRASS BEDS

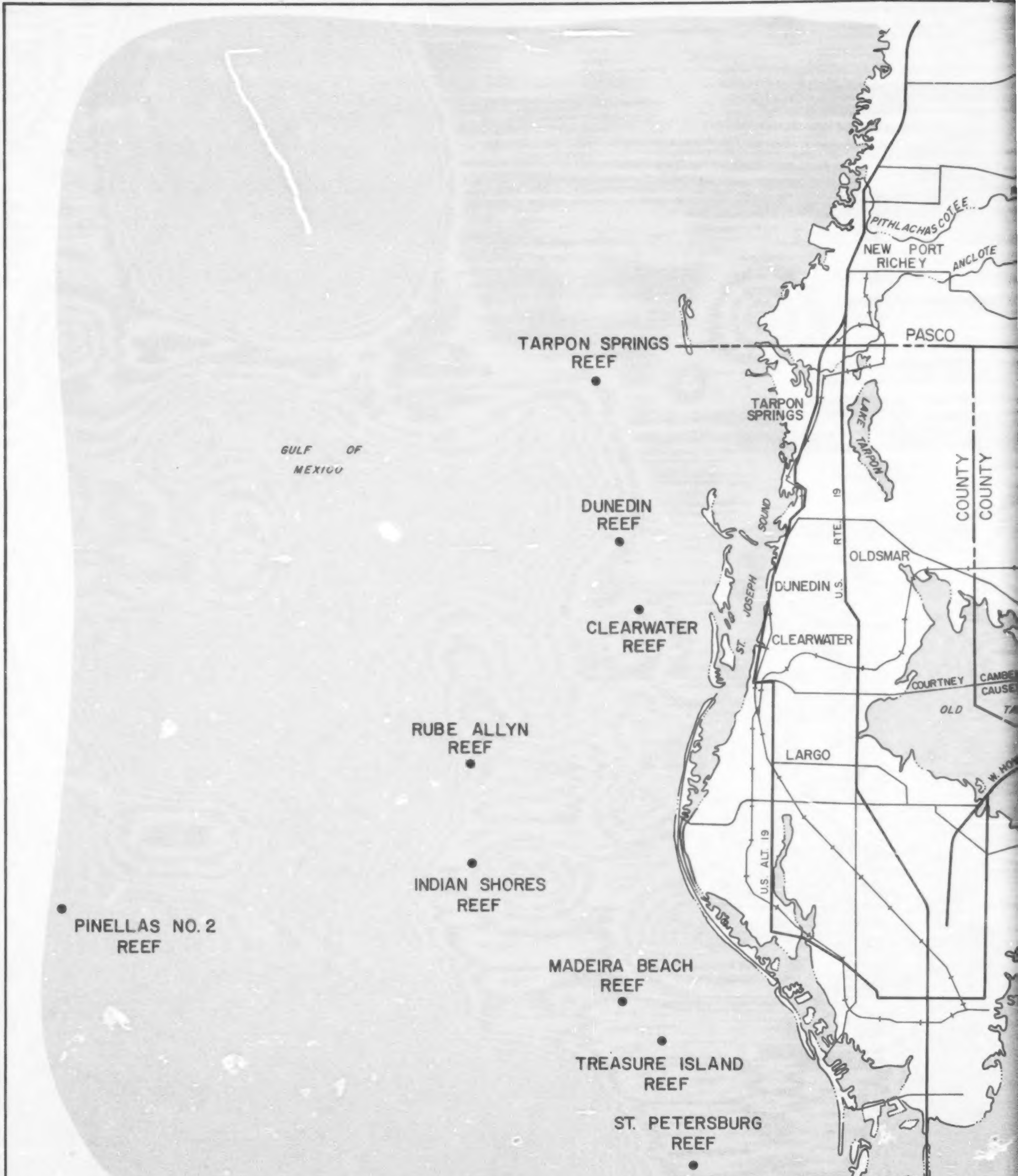
NORTH PINELLAS COUNTY, FLORIDA
ENVIRONMENTAL IMPACT STATEMENT

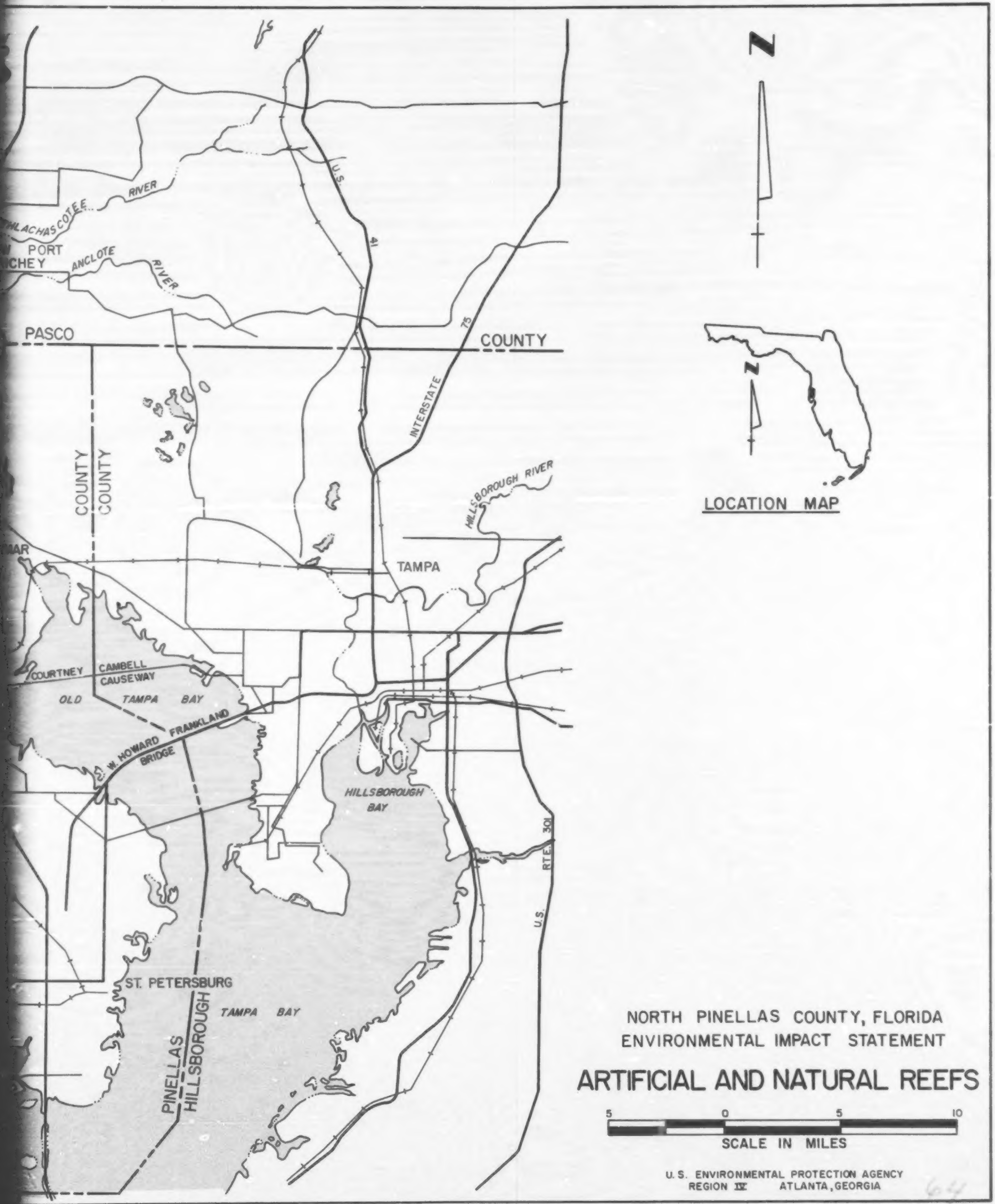
SUBMERGED GRASS BEDS

.5 0 .5 1 2
SCALE IN MILES

U. S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV ATLANTA, GEORGIA

FIGURE 3


GULF OF MEXICO
TARPON SPRINGS REEF
DUNEDIN REEF
CLEARWATER REEF
RUBE ALLYN REEF
INDIAN SHORES REEF
PINELLAS NO. 2 REEF
MADEIRA BEACH REEF
TREASURE ISLAND REEF
ST. PETERSBURG REEF
PITHLACHASCOTEE
NEW PORT RICHEY
ANCLOTE
PASCO
COUNTY
TARPON SPRINGS
LAKE TARPON
ST. JOSEPH SOUND
U.S. RTE. 19
COUNTY
OLDSMAR
DUNEDIN
CLEARWATER
COURTNEY
CAMBE
CAUSE
OLD
TA
LARGO
W. HO
U.S. ALT 19


N
LOCATION MAP
PITHLACHASCOTEE RIVER
PORT
RICHEY
ANCLOTE RIVER
PASCO COUNTY
U.S. 41
INTERSTATE 75
COUNTY
COUNTY
HILLSBOROUGH RIVER
TAMPA
COURTNEY CAMBELL CAUSEWAY
OLD TAMPA BAY
W. HOWARD FRANKLAND BRIDGE
HILLSBOROUGH BAY
U.S. RTE. 301
ST. PETERSBURG
TAMPA BAY
PINELLAS
HILLSBOROUGH
5
0
5
10
SCALE IN MILES

NORTH PINELLAS COUNTY, FLORIDA
ENVIRONMENTAL IMPACT STATEMENT

ARTIFICIAL AND NATURAL REEFS

U. S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV ATLANTA, GEORGIA

64

FIGURE 4

ecological value, provide other functions as well, including buffering against high tides and storms, purification of natural and man-made wastes and prevention of shoreline erosion. Wetland areas are shown on Figure 5.

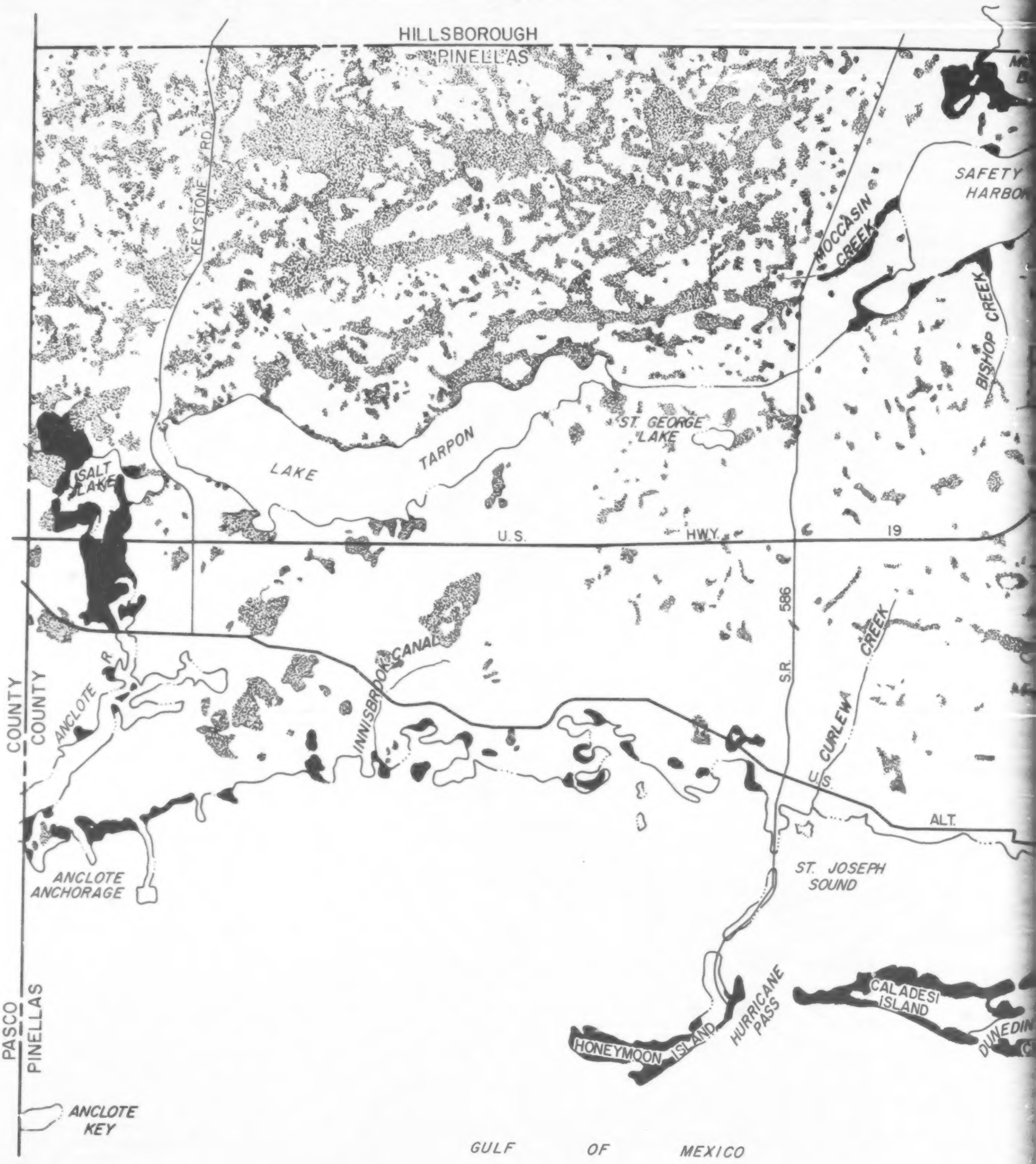
Barrier islands and their associated natural communities protect the coastal mainland from tidal action, waves and wind associated with tropical storms. Barrier island beaches are also a vital component of the local tourist industry. The larger barrier islands include Clearwater Beach Island, Honeymoon Island, and Caladesi Island. All of Caladesi Island and more than 90 percent of Honeymoon Island are maintained and protected as Florida state parks.

Freshwater marshes and swamps are the most productive inland vegetation communities and support abundant and diverse populations of plants and animals. Freshwater swamps include both cypress swamps and hardwood swamps that have very poorly drained and highly organic soils. Cypress and hardwood swamps are largely concentrated in the low areas east of Lake Tarpon. Freshwater marshes, which are low-lying communities dominated by herbaceous plants, are scattered but uncommon throughout the Study Area, with the largest expanses occurring north of Lake Tarpon.

Floodplains, while not necessarily ecologically valuable, are important because of potential hazards and damages resulting from development in these areas. Most floodplains coincide with wetland areas and are prevalent primarily in the northern portion of the Study Area adjacent to the Anclote River and east of Lake Tarpon. Flood prone areas are shown on Figure 6.

Aquifer recharge areas are considered sensitive areas because of the importance of local aquifers. The primary aquifer recharge areas are the area east of Lake Tarpon and the central portion of the Study Area from Lake Tarpon south to Gulf to Bay Boulevard. Aquifer recharge areas are shown on Figure 7.

Various springs, sinks and lakes, particularly Lake Tarpon, are considered sensitive areas because of their aesthetic value, recreational value, and their importance to the local hydrologic system. Wall Springs, in the central portion of the Study Area west of Lake Tarpon, is the only free-flowing freshwater spring in the Study Area. Tarpon Springs in the Anclote River and


HILLSBOROUGH
PINELLAS
KEYSTONE RD.
SAFETY
HARBO
MOCCASIN CREEK
BISHOP CREEK
ST. GEORGE LAKE
LAKE TARPON
SALT LAKE
U.S. HWY. 19
S.R. 586
CURLEW CREEK
INNISBROOK CANAL
ANCLOTE R.
PASCO COUNTY
PINELLAS COUNTY
U.S. ALT.
ST. JOSEPH SOUND
ANCLOTE ANCHORAGE
HONEYMOON ISLAND
HURRICANE PASS
CALADESI ISLAND
DUNEDIN
ANCLOTE KEY
GULF OF MEXICO

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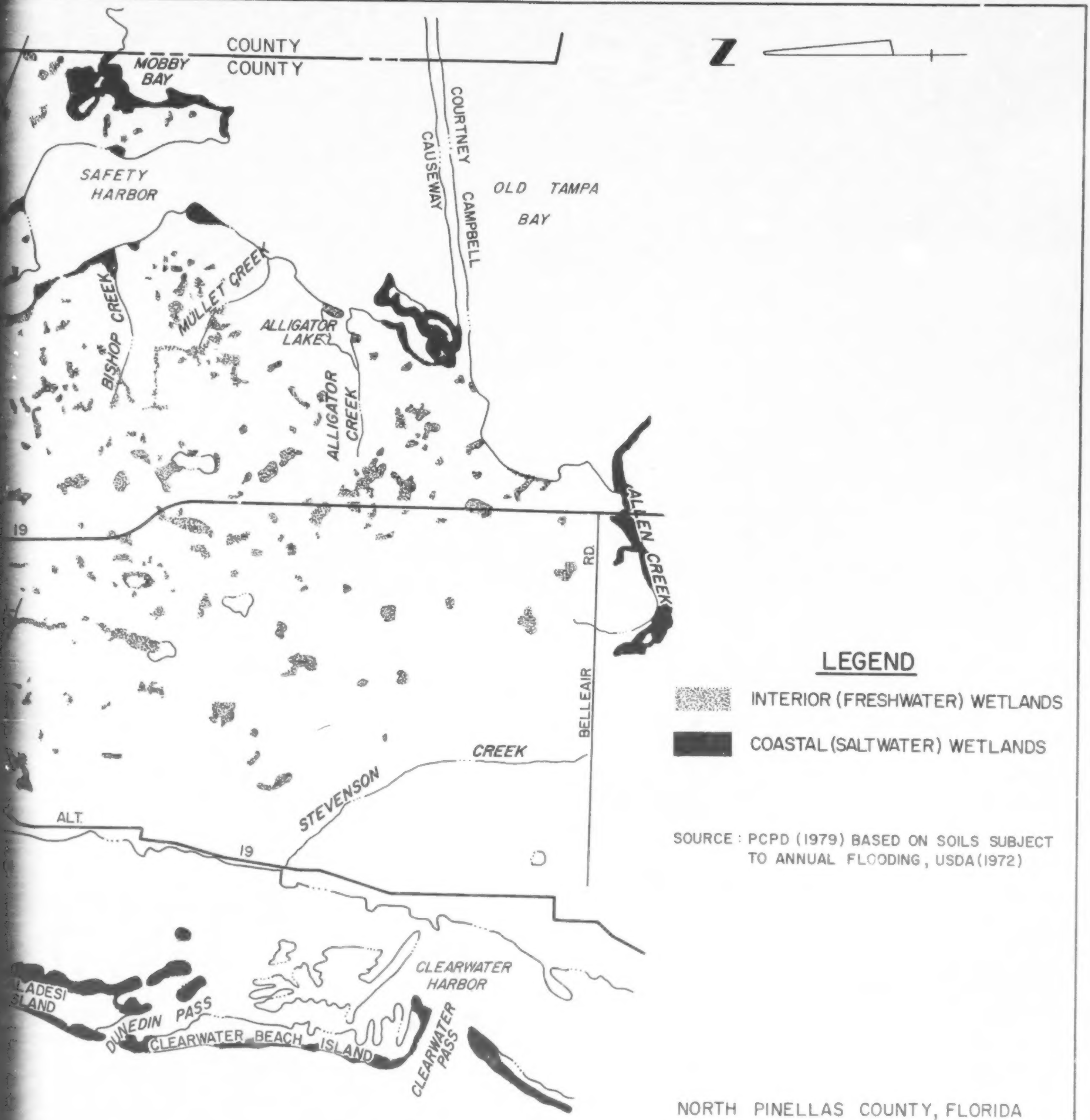

N
COUNTY
COUNTY
MOBBY BAY
SAFETY HARBOR
COURTNEY CAMPBELL CAUSEWAY
OLD TAMPA BAY
BISHOP CREEK
MULLET CREEK
ALLIGATOR LAKE
ALLIGATOR CREEK
ALLEN CREEK
19
BELLEAIR RD.
STEVENSON CREEK
ALT. 19
CLEARWATER HARBOR
LADESI SLAND
DUNEDIN PASS
CLEARWATER BEACH ISLAND
CLEARWATER PASS

LEGEND

▨ INTERIOR (FRESHWATER) WETLANDS

■ COASTAL (SALTWATER) WETLANDS

SOURCE: PCPD (1979) BASED ON SOILS SUBJECT TO ANNUAL FLOODING, USDA (1972)

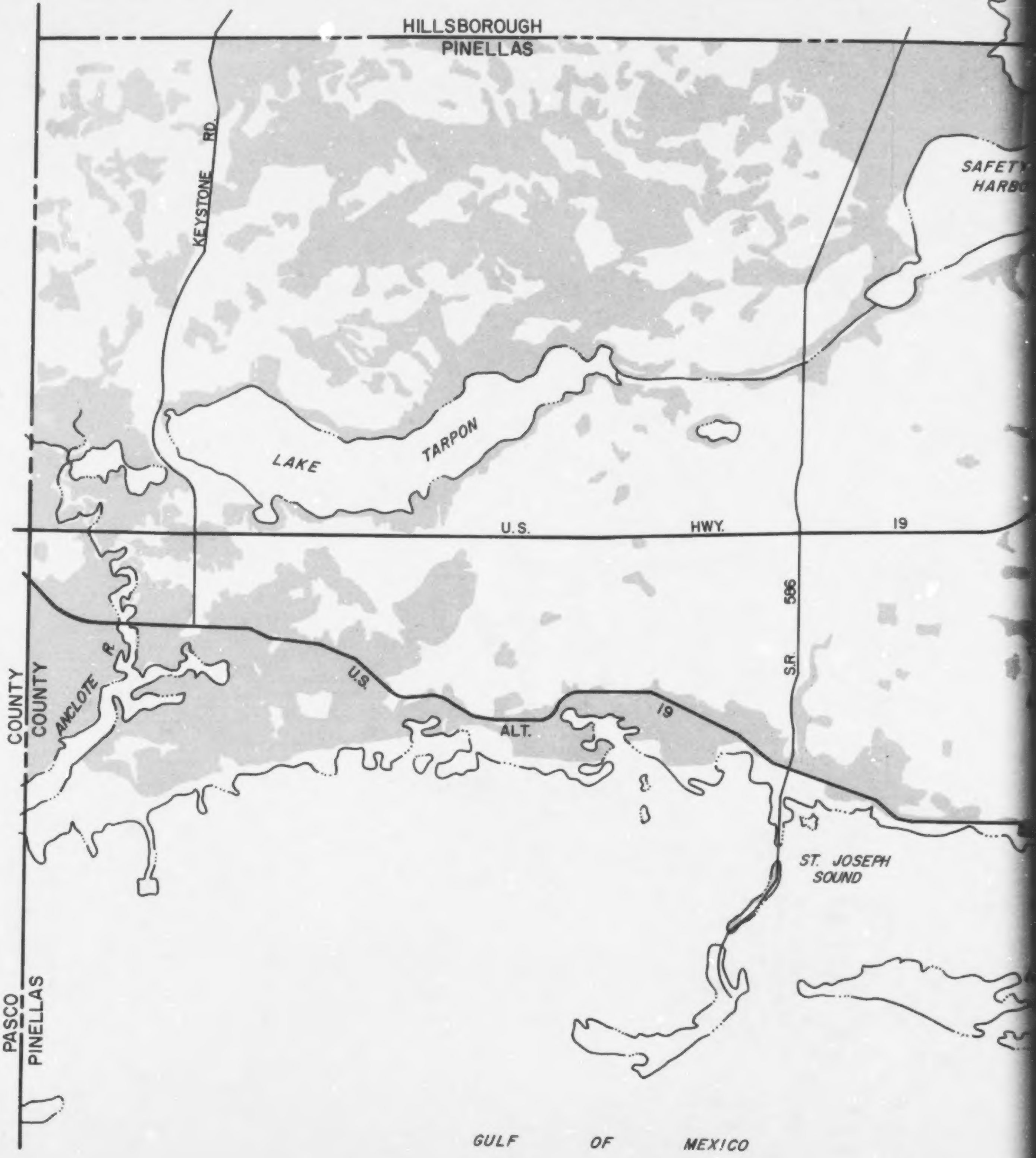
NORTH PINELLAS COUNTY, FLORIDA
ENVIRONMENTAL IMPACT STATEMENT

WETLANDS

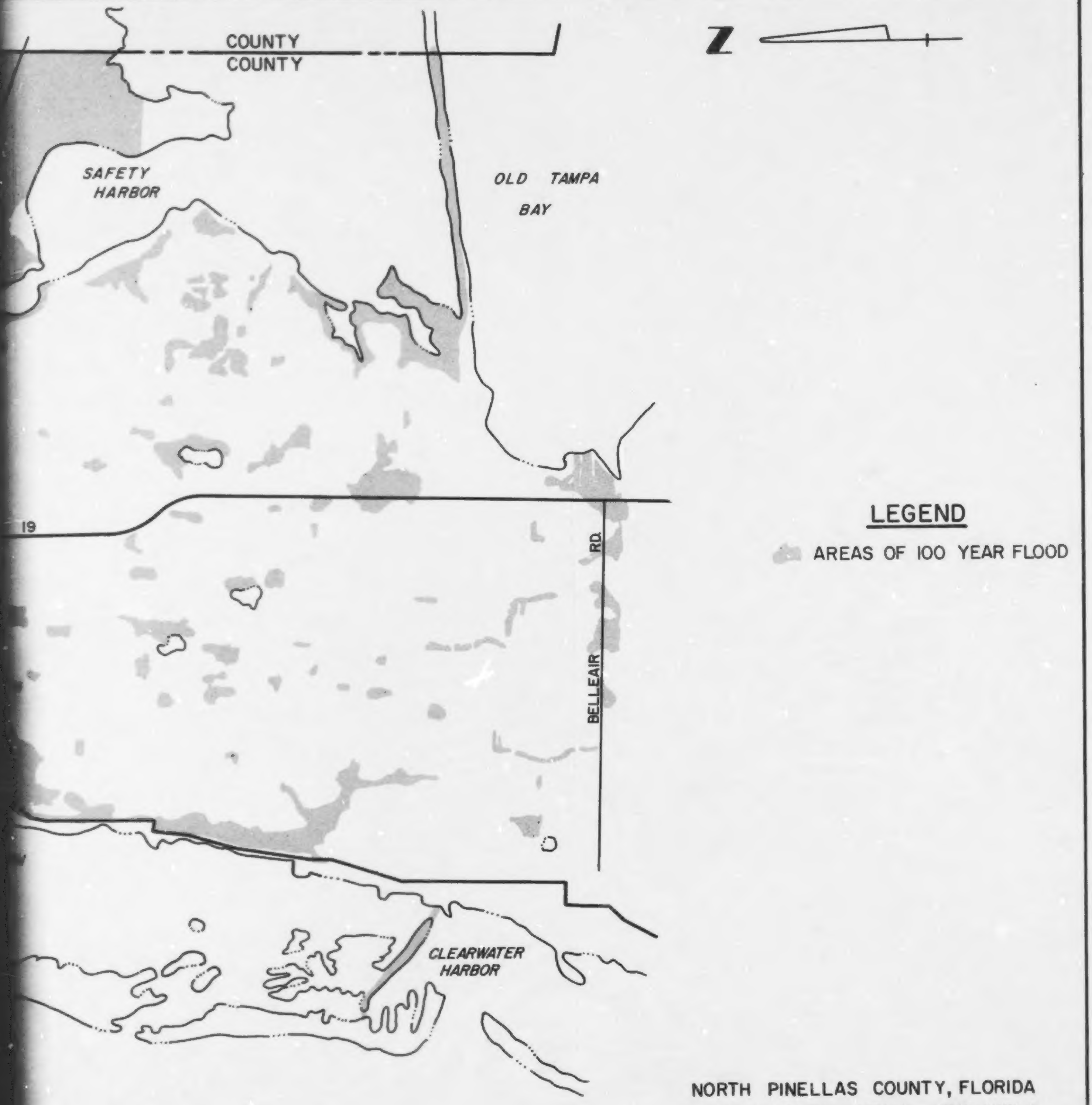
5 0 5 1 2
SCALE IN MILES

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV ATLANTA, GEORGIA

FIGURE 5


HILLSBOROUGH
PINELLAS
KEYSTONE RD.
SAFETY
HARBO
LAKE TARPON
U.S. HWY. 19
S.R. 586
U.S. ALT. 19
ANCLOTE R.
PASCO COUNTY
PINELLAS COUNTY
ST. JOSEPH SOUND
GULF OF MEXICO

SOURCE: DEPT. OF HOUSING AND URBAN DEVELOPMENT, FEDERAL INSURANCE ADMINISTRATION
JULY 8, 1977, AS PRESENTED IN: PINELLAS COUNTY PLANNING DEPT. (PCPD) 1979


COUNTY
COUNTY
SAFETY HARBOR
OLD TAMPA BAY
19
BELLEAIR RD.
CLEARWATER HARBOR
LEGEND
▨ AREAS OF 100 YEAR FLOOD

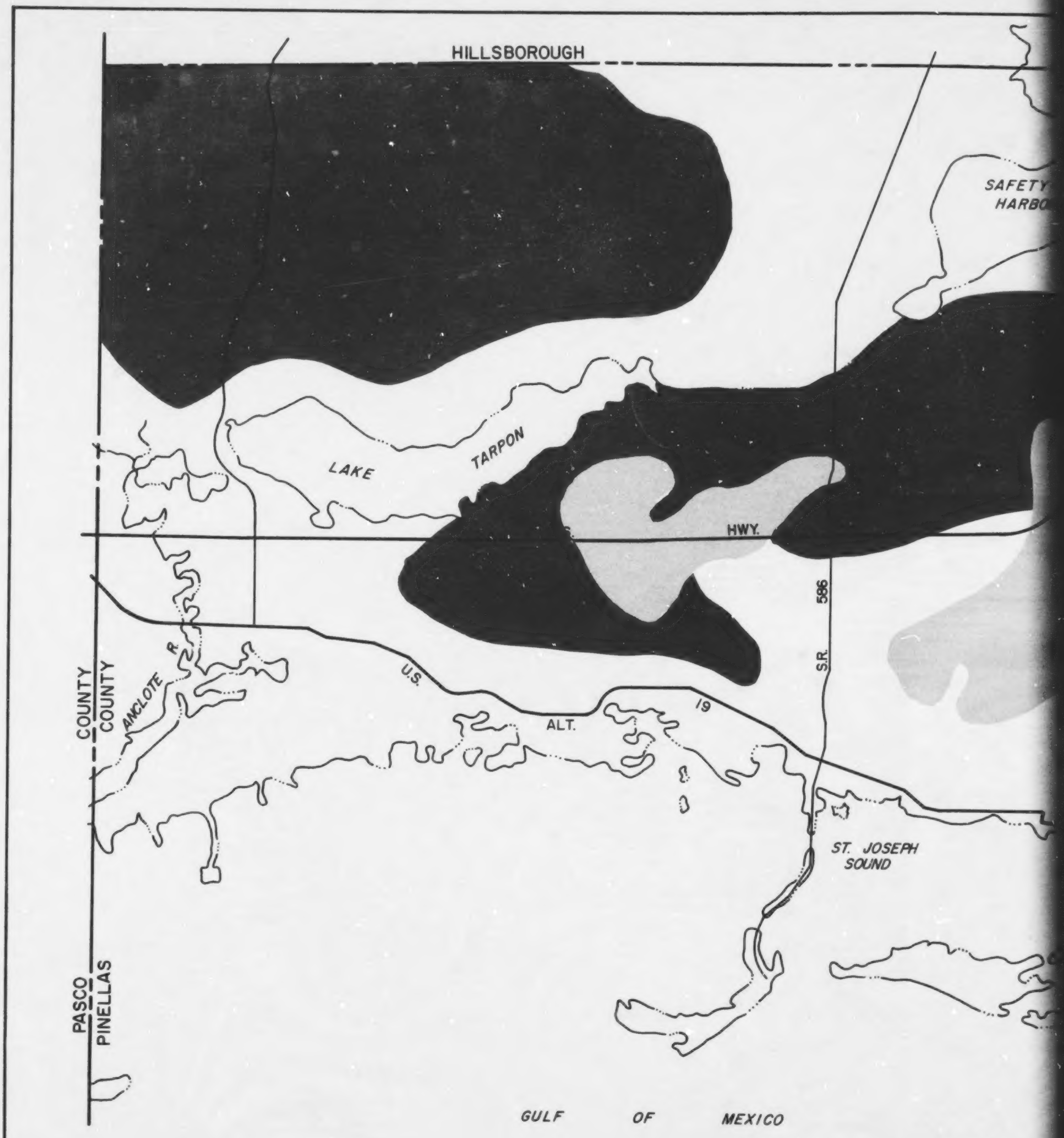
NORTH PINELLAS COUNTY, FLORIDA
ENVIRONMENTAL IMPACT STATEMENT

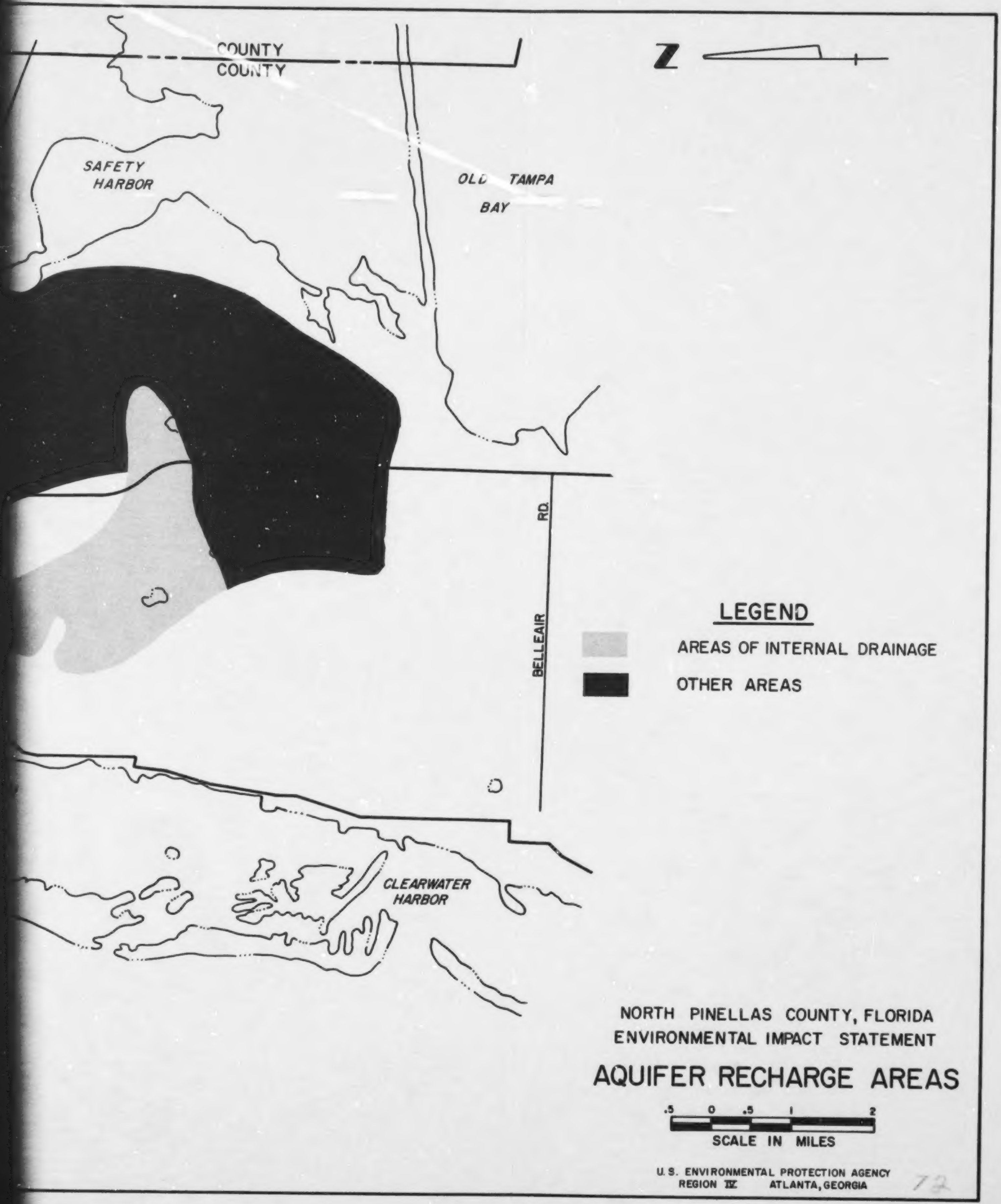
FLOOD PRONE AREAS

.5 0 .5 1 2
SCALE IN MILES

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV ATLANTA, GEORGIA

FIGURE 6


HILLSBOROUGH
SAFETY
HARBO
LAKE
TARPON
HWY.
586
S.R.
U.S.
ALT.
19
ANCLOTE
R.
COUNTY
COUNTY
PASCO
PINELLAS
ST. JOSEPH
SOUND
GULF
OF
MEXICO


COUNTY
COUNTY
Z
SAFETY HARBOR
OLD TAMPA BAY
BELLEAIR RD.
CLEARWATER HARBOR
LEGEND
AREAS OF INTERNAL DRAINAGE
OTHER AREAS
.5 0 .5 1 2
SCALE IN MILES

NORTH PINELLAS COUNTY, FLORIDA
ENVIRONMENTAL IMPACT STATEMENT

AQUIFER RECHARGE AREAS

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV ATLANTA, GEORGIA

FIGURE 7

Crystal Beach Springs in St. Joseph Sound are free-flowing springs that are submerged in saltwater. The salinities associated with these springs create unique aquatic ecosystems in these areas. Lake Tarpon is the largest body of freshwater in the Study Area and has a high recreational and aesthetic value for local residents.

PART C - ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES

All of the basic wastewater disposal alternatives - discharge to nearshore coastal waters, Gulf outfall, land application, water reuse and deep-well injection - have both advantages and disadvantages from purely an environmental viewpoint.

All environmental factors have been analyzed; the most important factors are the aquatic ecosystem (including water quality, aquatic life forms and water-related aesthetics), public health, and economic factors associated with barrier island beaches and overall desireability of the area for vacations or seasonal living.

Quantitative procedures that were utilized include:

- Predictions of 1975 and year 2000 non-point source loadings of five-day BOD and total nitrogen based on predictions developed as part of the Tampa Bay Areawide Water Quality Management Planning (208) process (TBRPC, 1982); and

- Predictions of dilution for wastewater that is discharged at the bottom of the Gulf of Mexico. The wastewater immediately rises upon discharge, because it is less dense than surrounding marine waters. A plume is formed which is more expansive as it continues to rise and be transported laterally by Gulf currents. Wastewater continues to be diluted as long as the wastewater rises and moves laterally away from the outfall.

Certain impacts can not be quantified in this EIS largely due to complex flow patterns within Pinellas County coastal waters such as (1) predictions of water quality within Old Tampa Bay or Clearwater Harbor - St. Joseph Sound as a result of wastewater discharges, and (2) relative effects of point sources (wastewater) and nonpoint sources of pollution (runoff). Wastewater discharges are year-round, while runoff discharges originate primarily between June and September.

1) Impacts of Wastewater Disposal Technologies

Table 10 lists principal types of environmental impacts associated with each disposal technology being evaluated.

(a) Discharges to Coastal Waters

Water movements and water quality in the Study Area are difficult to predict, particularly for the waters on the Gulf coast due to scarcity of existing data.

Table 11 summarizes the impacts associated with wastewater discharges to Old Tampa Bay, Clearwater Harbor - St. Joseph Sound, and the Gulf of Mexico.

Water quality analyses of the major estuarine bodies indicate that most estuarine bodies in the Study Area are currently stressed. Old Tampa Bay shows signs of overenrichment (e.g., algal blooms and sporadic fish kills). Even without higher loadings from wastewater treatment plants, five-day BOD and total nitrogen loadings to each water body would increase solely as a result of nonpoint source pollution, with the exception of Clearwater Harbor - St. Joseph Sound south of the Dunedin Causeway (Ross et al., 1977). Increased flows from discharges could result in increased solids, increased nutrient loadings, heavy metal contamination and bioaccumulation, or the toxicity of residual chlorines used in the treatment process.

Potential public health problems related to bacterial and viral contamination of surface waters are another environmental concern. Pinellas County Health Department officials have expressed concern over the effects of

TABLE 10

POTENTIAL ENVIRONMENTAL BENEFITS AND CONCERNS WITH EACH WASTEWATER DISPOSAL OPTION

Wastewater Disposal Technology	Potential Environmental Benefits	Potential Environmental Concerns
Discharge to coastal waters	o None	o Algal growths and impacts to fish populations; o Impacts to beach usage along Causeways; o Potential Impacts to shellfish areas in Old Tampa Bay; o Potential impacts to aquatic ecology; o Possible effects of discharges to Clearwater Harbor - St. Joseph Sound on barrier island beaches.
Gulf outfall	o Wastewater discharges are removed from the nearshore coastal waters.	o Public health concerns at barrier island beaches; o Impacts to fish population; o Possible disruption of grassbeds; o Possible sport fishing limitations due to excessive levels of metals and/or synthetic organic compounds in fish; o Bottom disruption along pipeline route; o Reduction in water quality at artificial reefs.
Land application and water reuse	o Water is reused for irrigation; water supply demands are thereby reduced. o Wastewater discharges to near-shore coastal waters are reduced.	o Public health concerns related to bacterial and viral transport at golf courses and parks receiving waste-water; o Increased contamination of adjacent wells (if any); o Potential disruption of habitat for protected species (gopher, tortoise and sand cedar) north of Clearwater and Dunedin.
Deep-well injection	o Adverse impacts on surface water quality, public health and re-creation associated with waste-water discharges to coastal waters or to the Gulf are avoided.	o Increased contamination of groundwater could occur if the wastewater could move through formation fractures.

TABLE 11

ENVIRONMENTAL PROJECTIONS
ASSOCIATED WITH NORTH PINELLAS COUNTY, FLORIDA
COASTAL WATERS

Affected Components	Principal Factors and Projections
Aquatic environment a. Old Tampa Bay	1. Increases in nonpoint source pollution (storm water runoff) are projected regardless of which EIS alternative is implemented. a. Urban-suburban nonpoint pollution forms are primarily solids, metals, BOD and grease/oils. b. 60 percent of average annual rainfall is experienced from June through September. 2. Phosphorus levels in Old Tampa Bay will continue to be high due to runoff and point releases from mining areas east of Tampa Bay.
b. Clearwater Harbor - St. Joseph Sound	1. Nonpoint source pollutant loadings are not projected to increase significantly by the year 2000 because the basin is nearly 100 percent developed. 2. Nonpoint sources contribute a smaller percentage of total water pollution in this water body than in Old Tampa Bay. 3. Availability of water quality data is quite limited.
c. Gulf of Mexico	1. As a wastewater plume would rise, dilution would allow water quality criteria for all wastewater constituents except phosphorus to be met within 50 feet of an outfall (see Table 12) 2. Dissolved oxygen depletions would most probably not arise, based in part on observations from other wastewater outfalls along Florida's East Coast and in California. 3. An outfall would not promote a bloom of red tide, according to Florida DNR, based on Gulf currents and red tide growth factors as compared to wastewater characteristics. The liklihood of a red tide being promoted is higher for more nearshore coastal waters, if the red tide would ever reach those waters. 4. The shallow water depths and unpredictable currents make predictions of wastewater impacts difficult and uncertain. Outfalls in other regions exist in significantly different environmental settings. Water quality and circulation data have been collected offshore and wastewater dilution predictions have been mathematically developed.

additional wasteloads on local confined coastal waters and potential health problems may also include contamination of the area's fisheries resources resulting from surface water discharges and possible treatment plant malfunctions.

Unlike Old Tampa Bay where nonpoint source pollution is a major problem, improvements in the water quality of St. Joseph Sound north and south of the Dunedin Causeway may be realized from controlling point source pollutant loadings, because nonpoint sources contribute a smaller portion of the total loadings. In addition, nonpoint source loadings into St. Joseph Sound are not projected to increase significantly by the year 2000 because the drainage area is almost fully developed. Under these circumstances, upgraded treatment levels or removal of point sources would significantly reduce pollutant loadings to this portion of St. Joseph Sound and could result in water quality improvements.

Even with the complete removal of all existing estuarine municipal point source discharges via a regional system, notable benefits to coastal waters would probably only occur in St. Joseph Sound south of the Dunedin Causeway because of projected increases in nonpoint source pollutant loadings elsewhere by the year 2000.

Potential public health impacts relate directly to the bacterial and viral levels in wastewater effluent and the subsequent potential for beach closures. Disease outbreaks could be traced to the ingestion of contaminated fish or shellfish or the use of receiving waters for water contact sports. Because most commercial shellfish waters within the Study Area are either closed or unclassified, public health concerns would therefore be focused on the area's public beaches.

In actual operation, different treatment processes remove bacteria and viruses from the effluent at different levels of efficiency. Secondary treatment with chlorination is generally considered effective in removing most bacteria and viruses. Chlorination does not appear, however, to provide as efficient deactivation of viruses as it does of bacteria. In addition, chlorinated organic byproducts are produced as chlorine reacts with the wastewater.

Other forms of disinfection are available, such as chloramines, ozone and ultraviolet radiation.

Overall, the recreation resources of the Study Area would likely suffer as a result of continuing existing surface water discharges at current or increased loadings. However, eventual closing of public beaches could also result from continued water quality degradation associated with nonpoint source pollution, especially in Old Tampa Bay.

(b) Gulf Outfall

Primary concerns with a Gulf outfall include beach closures, the potential for aquatic food chain impacts, bacterial and viral contamination of barrier island beaches, overenrichment with nutrients and resultant excessive phytoplankton growths, natural and artificial reef impacts and bottom disruptions. A major factor in evaluating these potential impacts is the amount of dilution that can be anticipated. Design factors that can determine the amount of dilution include effluent flow, water depth, number of outfall ports, port spacing and wastewater velocity. Additional discussions of environmental impacts associated with a Gulf outfall are presented in Appendix E.

Mathematical simulations were conducted to determine probable dilution rates based on several variables. The simulations were based on computerized codes obtained from the EPA Research Laboratory in Corvallis, Oregon. Some of these results are presented in Table 12. For example, given a water depth of 15 feet (minimum depth for an outfall) with a maximum discharge of 43 MGD, quality guidelines for toxic substances would generally be met within 0.5 miles of an outfall based on effluent characteristics following secondary treatment and chlorination. Bacterial levels for the more stringent shellfish waters would be met in a plume within 0.5 miles of an outfall. Assuming background phosphorus concentrations of 0.02 mg/l, the area within a three mile radius of the outfall would exceed the marine criterion of 0.05 mg/l, possibly resulting in an enriched area in which elevated plankton levels would be expected. Lower wastewater flows and/or deeper waters reduce the area needed for adequate dilution of effluent constituents.

TABLE 12

ESTIMATED DISTANCES FROM AN OUTFALL AT WHICH WATER QUALITY CRITERIA CAN BE MET WITHIN THE GULF OF MEXICO

Assumed Gulf Current Speed: 10 centimeters per second
Assumed Gulf Water Depth: 15 feet
Outfall Configuration: Numerous ports spaced 24 feet apart

Parameter	Desired Dilution to Meet Criteria (1)	Approximate Distance Along Water Surface From Outfall Within Which Desired Dilution is Reached, Feet For Various Wastewater Flows, Expressed in Millions of Gallons Per Day (MGD)(2)		
		9 MGD	24 MGD	43 MGD
Total Phosphorus	200 500	50 or less(4) 3,000	3,000 6,000	10,000 20,000
Total Nitrogen	60	50 or less	50 or less	3,000
Total coliforms				
- water contact	70	50 or less	50 or less	3,000
- shellfishing	2	50 or less	50 or less	50 or less
Fecal coliforms				
- water contact	36	50 or less	50 or less	3,000
- shellfishing	3	50 or less	50 or less	50 or less
Metals and Toxic Substance	60 (3)	50 or less	50 or less	3,000

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(1) Based on effluent characteristics following secondary treatment and chlorination: 10 mg/l total P, 20 mg/l total N, 2,000 and 500 MPN per ml of total and fecal coliforms respectively, and metal-toxic substance concentrations typical for secondary treated wastewater. Dilutions given for phosphorus and nitrogen do not take 1980 background concentrations monitored in the field surveys into account. Coliform background levels monitored during 1980 were 0 MPN per 100 ml.

(2) Includes blocking effects of an existing plume

(3) Typical seawater concentrations were taken into account in determining the desired dilution of 60.

(4) Distances of 50 feet or less are within zones of initial dilution, which is that zone in which dilution takes place due to buoyant rising of the wastewater plume.

Dissolved oxygen depletions and prolonged or additional red tide blooms are not considered likely impacts from a Gulf outfall. Dissolved oxygen depletions would be the result of the BOD levels of wastewaters, but this has never been a problem near existing outfalls in eastern Florida or California. Red tide blooms originate ten to forty miles offshore from encysted resting stages of algae called dinoflagellates. Nutrients from an outfall would be only one of a number of key conditions such as water temperature that are needed to maintain a red tide bloom. There is concern if red tide bloom would move into Old Tampa Bay or Clearwater Harbor-St. Joseph Sound where water movements are slower and warmer, more shallow waters rich in nutrients are more likely to prolong and/or intensify a bloom.

Facts about an outfall relevant to the impact on beaches associated with bacteria and viruses include the following:

- The discharge will have undergone secondary treatment and subsequent dilution of 40 to 50. Floatable materials are removed during secondary treatment by scum scrapers attached to clarifiers.
- Winds from the west do not seem to push Gulf waters directly onto beaches based on dye studies conducted as part of this EIS. Current measurements or dye monitoring during periods of south winds have not been made for the local offshore area.
- Virus detection, removal during treatment, dispersion and die-off in marine waters are not documented nor well understood.

Results from dye releases conducted during 1980 in the Gulf off the Study Area coast by Mote Marine Laboratory suggest that it is quite difficult to predict conditions under which wastewater would travel toward local beaches (see Appendix C). Even though no dye releases have been monitored during months with heavy precipitation, natural forces appeared to inhibit eastward dye movement.

A worst-case-scenario for dye movement toward beaches would be west to southwest winds during periods of low runoff. Conditions like these are most likely to occur from April to June.

In light of the uncertainties outlined in this section and the major impact of beach use of the county's economy, the approach in evaluating a Gulf outfall is to establish multiple protection or a large safety factor to block environmental transmission of disease. The best methods for providing such protection are considered to be wastewater filtration, disinfection and an outfall design that maximizes initial dilution. In addition, placing a discharge four miles or more offshore from bathing areas should provide an adequate margin of safety and protect the public health. Because of significant diver use of the artificial reefs, these waters should be considered body contact areas relative to pathogens.

One final consideration to note is the potential for treatment malfunctions and extreme weather or flow conditions prior to discharge through a Gulf outfall. Malfunctions are often likely to occur during times when maximum flows and loadings are being experienced. These times are during the tourist season when use of beaches or swimming is also high. If disinfection malfunctions occurred at the time they are most probable, beach use during the tourist season could be impacted.

Potential Gulf outfall locations were evaluated based on beach locations, reefs, bottom habitats, grassbeds and shellfish areas. Preferred outfall locations are not, however, identified. An outfall extending northwestward off Honeymoon Island would traverse less hardbottom reef areas than would be expected further south based on survey data. Actual pipeline corridors could be adjusted in order to avoid coral reefs, man-made reefs, or grassbed communities. The immediate area of the outfall, probably a 100 - 200 feet radius, would be expected to experience a change in the bottom community due to the discharge. Outfall construction would physically destroy the organisms in the sediments, but recovery (recolonization) is known to be quite rapid. A coral reef, however, would not recover in any reasonable length of time. Therefore, its destruction would be considered a permanent loss. Construction and operational impacts to the significant natural reef areas can best be minimized by not placing an outfall in the southern portion of the Study Area.

The Dunedin Artificial Reef could be impacted by a discharge four miles off Honeymoon Island. Calculations of achievable dilutions indicate that all standards related to reef usage can be met.

From an environmental and safety standpoint, a buried pipeline would be preferred. A buried pipeline would present less hazard to navigation and would also be less susceptible to hurricane damage. However, based on past experience, pipeline burial may double the cost of an outfall pipeline.

(c) Other Disposal Technologies

Groundwater impacts from land application, water reuse or deep-well injection are related to groundwater use (public and private water supplies) and effluent disposal. Water conservation and water reuse in conjunction with most alternatives would result in beneficial impacts in terms of reduced groundwater consumption. Controlled groundwater use is vital in order to protect the existing sources of potable water in the Study Area.

Slow-rate land application would not provide significant groundwater recharge. Rapid-rate land application or water reuse, on the other hand, would provide some local recharge and therefore, some impacts on groundwater quality which could result in increased contamination of public and private wells. However, as long as secondary treatment and filtration are provided for water and permeable sand-silt-clay soils receiving the wastewater remain unclogged, impacts on groundwater quality are not expected to be a concern. Only some of this recharge would reach the deeper water supply (Floridan) aquifer through fractures and sinkholes penetrating through confining layers.

With the stipulation that deep-well injection only be permitted where a confining layer at least 50 feet deep is present, impacts of injected wastewater on potable water supplies would not be felt for many years, assuming the wastewater is not transported through any confining layer fractures. Even if pressure is available to push injected wastewater toward a potable supply, approximately 480 years would be required to push the wastewater through 50 feet of an unfractured confining layer, assuming the vertical hydraulic conductivity of the confining layer is 10^{-7} centimeters per second (which is typical for claylike formations).

Impacts of land application and water reuse on terrestrial biology are not as significant as impacts related to residential development. The impacts associated with home construction and draining of low-lying areas are more significant than by use of parks or golf courses for wastewater disposal. A survey of wildlife and vegetation at potential land application sites indicated the presence of two protected species on certain sites: The Gopher tortoise (*Gopherus polyphemus*) and the sand cedar (*Ceratiola eriocoides*). These species are protected by the State, they but are not listed on the federal list of Endangered and Threatened Species.

In some ways, land application and water reuse systems could benefit plant and wildlife communities. Maintenance of open areas could increase habitat diversity and enhance wildlife populations through an increase in the "edge effect". This transition zone between two ecosystems provides a unique habitat for certain plants and animals that prefer a variety of habitats. Plant communities could further benefit from increased irrigation and nutrients.

2) Impacts East of Lake Tarpon

Much of the area east of Lake Tarpon is low-lying and not suitable for development without extensive drainage and sewering. In such areas, adequate unsaturated soil depth for on-lot wastewater systems, even shallow placement systems, can not be engineered or would not be allowed by state on-lot regulations. A minimum of four feet of year-round unsaturated soil depth is needed for innovative on-lot systems or any land disposal system to be effective.

An important characteristic of any wastewater disposal system east of Lake Tarpon is to avoid adverse impacts to Lake Tarpon itself. Wetland areas east of Lake Tarpon are also considered important ecological resources. Limited amounts of wastewater void of hazardous substances could beneficially be assimilated within wetland areas. EPA-Region IV is currently investigating use of freshwater wetlands in the Southeastern United States for wastewater management.

Any loss of wetlands east of Lake Tarpon due to residential development would result in loss of capabilities to maintain water quality. Drainage patterns, sedimentation, and assimilation of particles mobilized due to a rainfall event are adversely affected by converting a wetland area to lands which are less productive biologically and which can not store and purify quantities of water. Wetlands are also habitat, for many aquatic and terrestrial species.

Within the Brooker Creek drainage area, loss of wetlands could result in a decline in the water quality of Lake Tarpon because untreated runoff from residential areas is more detrimental than natural drainage from wetlands. Within all areas east of Lake Tarpon, water quality within Upper Old Tampa Bay would most probably decline if residential development east of Lake Tarpon continues.

PART D - IMPLEMENTATION CONSIDERATIONS

Numerous planning and administrative factors exist that should be considered in the implementation of each alternative.

Public education can relieve many misconceptions about local wastewater management. EIS committies could help greatly with informing the public of the proposed wastewater management plan.

For a Gulf outfall alternative a number of factors need to be considered, including: a video survey of the proposed outfall route, length of outfall pipe required, obtaining required approval to traverse Intracoastal Waterway, specifying a method of securing the pipeline, protecting the outfall from extensive sand movement and evaluating chlorination safeguards.

For deep-well injection alternatives, a number of efforts would need to be conducted: location(s) of deep-wells, securing long-term site access, installation and monitoring of test wells, and injection tests to determine the capacity of the formation to receive wastewater. A decision whether to disinfect prior to disposal would also need to be made.

For land application and water reuse, a number of considerations are important. The type of application system must be selected (i.e. spray irrigation, trench distribution, or overland flow). The application rate (e.g. inches per week), depths to water table, bedrock isolation distances, and slope of land must all be evaluated. Operational procedures are important, particularly during wet periods. Finally, securing long-term site access and use of land is critical to the success of this wastewater disposal alternative.

For on-lot systems, considerations similar to those listed for land application and water reuse are important. The type of disposal system (in addition to a septic tank) must be selected from the following: standard trenches, standard bed, sand mound, or shallow placement system with or without pressure distribution or alternating systems. The size of each disposal area needs to be determined based on field results. State of Florida rules and regulations pertaining to bedrock, acceptable slope, percolation rates, isolation distances and implementation procedures need to be followed. Finally, on-lot management options should be evaluated.

PART E - MITIGATIVE MEASURES

Potential measures to mitigate adverse impacts for each of the alternatives considered are discussed below. In some cases, these mitigative measures could become conditions for receiving EPA Construction Grant funding.

In this section, possible mitigative measures are listed for each basic wastewater disposal option being evaluated.

(a) Outfall(s) to the Gulf of Mexico

- Procedures during times of unfavorable conditions (WWTP malfunctions, flow towards shoreline): storage, alternative disposal method/location.

- Mark pipeline route with buoys.

- Prohibit netting or trawling near unburied outfalls.

- Monitoring: flow patterns, coliform and virus counts, dissolved oxygen, pH, nutrients, biological monitoring of benthic community, weather conditions, i) selected parameters, ii) sampling frequency, iii) sampling locations, iv) more intensive, short-term studies. EPA assistance is available for developing specific components of any monitoring program.

- Occasional monitoring of outfall pipeline for leaks/breaks.

- Precautionary posting at bathing beaches when WWTP(s) malfunction.

(b) Deep-well injection

- Monitoring wells at wastewater disposal sites and most proximate water supply wells: water levels, chloride/conductivity, total nitrogen, nitrate-nitrogen, metals, and total organic carbon. Sampling procedures and frequency can be established with guidance from USGS.

(c) Land Application and Water Reuse

- Normal operating procedures: rate and duration of each application, check for soil clogging.

- Application procedures during wet periods and use of back ups.

- Regular, preventative maintenance of sprinkler systems.

- Monitoring wells at wastewater disposal sites and most proximate water supply wells: water levels, chloride/conductivity, total nitrogen, nitrate-nitrogen, metals, and total organic carbon. Sampling procedures and frequency can be established with guidance from USGS.

(d) On-lot Systems

- Inspections of vegetation and soil conditions, perhaps every two years.

- Operating procedures for use of any alternating absorption fields or for pressure distribution systems will need to be specified.

(e) Other Mitigative/Enhancement Measures

- Proper operation and maintenance of WWTPs (including methods to encourage WWTP operators to solicit help with unusual malfunction events).

- Disinfection - pros and cons in terms of potential health effects and costs are worth consideration.

- Nonpoint source controls, costs, feasibility, and potential benefits should be evaluated for the entire County and for Hillsborough County.

- Water conservation has affordable costs and obvious benefits but may result in some inconveniences. Public education and test-scale installations are recommended as a first implementation step.

Mitigative measures associated with malfunction events are presented in Table 13.

TABLE 13

MITIGATIVE MEASURES ASSOCIATED WITH POTENTIAL MALFUNCTION EVENTS

Description	Impact	Possible Mitigative/ Enhancement Measures
Odor at wastewater treatment plants (WWTPs)	Inconvenience and potential public health concern to residents "down wind" from WWTP	o Treatment process monitoring and trouble-shooting. o Design and construct additions well in advance of a WWTP reaching its capacity.
Beach closures	Lack of disinfection and/or breakage of underwater discharge pipes	o Design outfall diffuser to avoid plume merging. o Underwater pipe inspection. o Close monitoring of chlorine addition. o Avoid discharges when water movement is toward beaches. o Wastewater filtration. o Trenching or burial of outfall pipe extending from shore.
Blooms of algae and fishkills	Excessive productivity and low levels of dissolved oxygen.	o AWT. o Avoid discharges to confined coastal waters. o Regular water quality monitoring at and around discharges. o Avoid excessive wet-weather discharges.
Soil clogging and/ or groundwater contamination	Inability to use a site for land application or water reuse. Abandonment of a local groundwater for water supply.	o Site investigation prior to design. o Avoid excessive application rates. o Wastewater filtration. o Land application site and groundwater monitoring. o Disking topsoil as part of disposal site maintenance.
Infrequent operation and maintenance for on-site and small community systems	Effluent ponding and runoff to Lake Tarpon or to other downstream surface water resulting in loss of recreation opportunities.	o Annual or bi-annual inspection of system. o Maintenance as needed. o Public awareness of what constitues a system failure and the need to report such a failure. o Storage of effluent from small community systems during wet periods. o Regular effluent monitoring by responsible city or county agency. o Management agency to be responsible for prompt inspection, operation and maintenance.

CHAPTER IV

DESCRIPTION OF EPA DECISIONS

One specific, preferred alternative, or group of alternatives, can not yet be selected as eligible for Federal funding. Instead, results of this EIS are presented: (1) in terms of groups of alternatives which may become eligible for Federal funding including the environmentally preferred alternative and (2) in terms of overall results of the alternatives evaluation effort: cost analyses, in-depth consideration and (where possible) quantification of projected environmental impacts, evaluation of operational considerations for the various technologies, and evaluation of procedures for implementing the alternatives.

PART A - BASIS OF DECISION

Wasteload allocations for Old Tampa Bay, Clearwater Harbor - St. Joseph Sound have not yet been established. These wasteload allocations will prescribe required levels of treatment for wastewater discharges to these coastal waters. The allocations will be established by the Florida DER with EPA-Region IV approval. The EPA will not recommend wastewater management alternatives at this time which may later not be in accord with these future wasteload allocations. Recommendations for service areas in which wasteload allocations are not involved are offered. All aspects of wastewater management: costs, environmental impacts, operation and implementation should be evaluated within the wasteload allocation process.

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PART B - EIS RECOMMENDATIONS

These recommendations are related to three major EIS issues:

- Disposal options for sewered areas of North Pinellas County;
- Management options for the area east of Lake Tarpon; and
- Statements concerning a Gulf outfall of treated wastewater.

Certain aspects of the recommended alternatives cannot be given until approved wasteload allocations (including effluent limits and discharge locations) are available from Florida DER.

1) Disposal Options for Sewered Areas of North Pinellas County.

The Draft EIS narrows the field of reasonable alternatives by outlining general costs, environmental impacts, operability concerns and implementability limitations associated with the EIS-generated alternatives. Least costly disposal options are identified and an environmentally preferred approach is recommended. The EIS does not identify a selected alternative for wastewater disposal for the currently sewered portions of North Pinellas County because of a lack of approved wasteload allocations for Pinellas County's surface waters.

It is the recommendation of the Draft EIS that non-potable wastewater reuse at parks, golf courses and other lands (and water conservation) be identified as the environmentally preferred alternative. The need for a wet weather backup for wastewater that cannot be reused is likely to exist. Potentially feasible backup options include continued but intermittent surface water discharges or deep well injection.

Reuse is the only management option that responds to the area's surface water quality problems while addressing groundwater supply limitations. The costs, advantages, and disadvantages of wastewater reuse, which are summarized below, are discussed elsewhere in the Draft EIS. Cost comparisons between reuse and non-reuse options and the costs of the least costly disposal options are also presented in the Draft EIS.

The advantages in wastewater reuse include: 1) potentially high public acceptance, 2) reduced reliance on surface water discharges (and resultant water quality improvements) and 3) reduced strain on limited public groundwater supplies. The disadvantages lay in: 1) high cost, 2) the need for wet-weather back-ups (surface water discharge back-ups are constrained by lack of approved wasteload allocations), 3) operability considerations which include soils variations and the need for reliable maintenance at numerous dispersed sites, and 4) amount of wastewater reused is dependent upon private decisions and commitments. In general terms, the cost of wastewater reuse represents an additional $41 to $48 million beyond the costs associated with surface water disposal options at AWT and secondary treatment levels, respectively. These costs include reuse at all study area facilities (i.e., Oldsmar; Clearwater Northeast, East and Marshall Street; Dunedin; North Pinellas and Tarpon Springs).

It should be noted that this recommendation is to identify the environmentally preferred alternative, not the "fundable" alternative. The "fundable" alternative will be selected upon completion of the wasteload allocation process. Additionally, identification of the environmentally preferred alternative does not preclude the consideration of other disposal options (e.g. deep well injection). Deep well injection is a disposal option that had been considered as both a primary and backup disposal option. Local agencies may wish to pursue further deep well investigations to determine its feasibility as a disposal option and its relationship to a reuse alternative.

Florida DER has indicated and the EPA has concurred that a wasteload allocation specifying advanced secondary treatment (AST) is appropriate for the Tarpon Springs discharge to the Anclote River given current water quality considerations. The effluent concentration must not exceed the following average concentrations: 6 milligrams per liter (mg/l) of five-day BOD, 6 mg/l of suspended solids, 6 mg/l of total nitrogen and 3 mg/l of total phosphorus. Based on this effort, continued discharge to the Anclote River has already been pursued by Tarpon Springs. Decisions in the North Pinellas service area can be made independently of wasteload allocations. Land application of treated wastewater on-site and at the Innisbrook Country Club is the most cost-effective, environmentally sound disposal option for this area.

2) Wastewater Management for the Area East of Lake Tarpon

Existing wastewater management methods east of Lake Tarpon involve individual septic tanks with absorption field systems and private package plants that serve planned community developments with land application of effluent within that development. With proper maintenance and sufficient acreage, this practice has, apparently, been successful. Water quality or public health problems associated with these existing systems have not been documented. The County, however, has expressed a desire for wet weather back-ups (e.g., surface water discharges) for these land application systems. The thrust of facilities planning in this area is toward the provision of facilities for future population growth.

The area east of Lake Tarpon contains many sensitive environmental features that could be potentially impacted by increased development. The area is drained by Brooker Creek, a major drainage basin of Lake Tarpon. This tributary system is composed of a network of wetlands and floodplains that comprise approximately 33 percent of the area east of Lake Tarpon. Much of the area is also a groundwater recharge zone which is critical to the long term viability of the area's groundwater supply. One of the area's major public water supply well fields is located in this portion of the Study Area. EPA's participation in funding facilities that would support development could adversely affect these sensitive environmental features.

It is the recommendation of the Draft EIS that EPA not provide funding assistance for wastewater facilities in the area east of Lake Tarpon. The reasonable alternatives have been evaluated in terms of cost, impact, reliability and implementability. No water quality or public health needs have been identified necessitating any major actions, and the provision of additional facilities would promote growth in environmentally sensitive areas. County and private developers should provide facilities if desired to support future growth.

EPA's Construction Grants Regulations allow the Agency to fund facilities only to serve capacity for flows existing on the date of Step 3 grant award, but not to exceed 1990 flows. Since the basis for many of the alternatives for the area east of Lake Tarpon is to serve future development, the Agency's funding role in this area should be limited.

Since the EIS recommendation in this area does not involve a surface water discharge, the wasteload allocation process is not a factor.

Scientific and engineering support for proper management of on-lot and other small wastewater systems east of Lake Tarpon is available from numerous sources. The EPA's experience with guiding the management of small wastewater systems throughout the United States may be helpful to local wastewater managers, and such experience is available upon request. Some suggestions for providing the most effective management of small wastewater systems are the following:

- Interactions between the local health agency and homeowners are quite important. A Homeowners Guide may be worth the effort needed to prepare.
- Engineers should be qualified and installers should be licensed to work with all types of on-lot systems to be utilized.
- Installers could be required to submit quarterly activity reports (e.g. maintenance and septage hauling activities - amounts and locations).

3) Environmental Statements Concerning a Gulf Outfall for Treated Wastewater

A Marine Sampling Program was conducted as part of the EIS to collect data to develop a Gulf outfall alternative for wastewater disposal to consider along with other disposal alternatives. The Marine Sampling Program was also designed to generically demonstrate the evaluation methodology that should be used in considering a Gulf outfall. Physical, biological and chemical data have been obtained in the EIS Marine Sampling Program. The Study Area for the sampling program included 20 miles of the coast, from the Belleair Beach Causeway north to the Anclote River, and extended 10 miles offshore of the barrier islands.

Of the numerous environmental factors to be considered, three were chosen as being the most important in the consideration of a Gulf outfall in this area: potential health and aesthetic impacts at bathing beaches, ecological impact to natural reef hardbottom-limestone outcrops, and impairment of the beneficial uses of the manmade fishing reefs.

The following statements concerning a Gulf outfall from northern Pinellas County can be made based on the Marine Sampling Program and EIS evaluations:

- It would provide the area with a reliable long-term wastewater disposal option;
- It would require a major investment of capital in a disposal option that would tend to discourage the environmentally preferred alternative of wastewater reuse;
- It would involve the environmental tradeoffs of minimizing impact to estuarine waters while increasing impacts to the Gulf (i.e., bottom disruption and community alteration, attractant to fish and other organizms causing impacts, nutrient impact);
- It would remove a development constraint that would potentially promote higher density development and development in environmentally sensitive areas which are not suitable for on-lot or recycle wastewater management;
- Secondary treatment and disinfection of wastewater would be necessary to minimize adverse impacts of an outfall on local beaches;

- Station 3F was selected for detailed study to demonstrate the generic methodology for evaluating the Gulf outfall alternative. The area of Station 3F which is roughly four miles offshore from Honeymoon Island, was found to be less environmentally sensitive than other sites located closer to shore that were evaluated during the Marine Sampling Program;

- Station 3F appears to be more cost effective than other stations evaluated during the Marine Sampling Program based on estimated cost and combined impacts to public health, the St. Joseph Sound estuary and natural hardbottom reef habitat;

- Nearshore Gulf currents vary such that predictions of effluent movement from a discharge are uncertain. Dye discharged in the area of Station 3F during the Marine Sampling Program generally moved in a south-southwesterly direction. A discharge plume in the area of Station 3F would be expected to have minimal impact on the area's beaches;

- Any further consideration of discharge sites near Station 3F should focus on areas slightly north of the exact study location to further minimize potential impacts to usage of the Dunedin Artificial Reef;

- The precise outfall alignment and point of discharge would require additional site-specific analyses (i.e., site specific studies to select the exact outfall route, the discharge point and required mitigation);

- Any further consideration of Station 3F or any other potential Gulf outfall site would be subject to permit/administrative review and approval.

PART C - REMAINING ALTERNATIVES

Wasteload allocations for Old Tampa Bay and Clearwater Harbor-St. Joseph Sound are in the process of being developed. The selected treatment level for each body of water could be as minimal as secondary wastewater treatment or as stringent as not allowing any wastewater discharge.

Therefore, all of the screened alternatives listed in Table 1 and evaluated in this Draft EIS for the Clearwater East, Clearwater Northeast, Clearwater Marshall Street, Dunedin and Oldsmar service areas remain under consideration. Costs, impacts on the environment, operability and implementability of all remaining alternatives are presented in this Draft EIS.

Two additional points need to be emphasized. The first is that no wastewater alternatives for Clearwater and Dunedin can be determined to be eligible for funding under the Construction Grants program until the wasteload allocations have been finalized through Florida DER. The second point is that any statements about a Gulf outfall extending from the North Pinellas County Study Area pertain only to this EIS. Statements made about potential impacts of a Gulf outfall may not be applicable to other locations along the Gulf coast.

CHAPTER V

EIS COORDINATION

Communications with state and local agencies, universities and private groups are important in the preparation of environmental impact statements. For the North Pinellas County Wastewater Facilities EIS, a public scoping meeting was followed by four meetings with each of two distinct committees: a citizen review committee and a technical advisory committee. Prior to each committee meeting, a draft task report for each phase of the EIS was provided to each committee member, so that the members could provide the most constructive comments at each committee meeting. The names of all committee members are listed in Table 14.

Input from various local, regional, state and federal agencies was also obtained, in addition to input from the two committees. Such input is greatly appreciated by the U.S. EPA - Region IV. A list of the various agencies and groups which assisted the EIS preparers appears as Table 15.

Four different subcontractors and consultants were utilized as part of this EIS effort in addition to the EIS preparers shown in Chapter VI. Their project roles were as follows:

- Mote Marine Laboratory (Subcontractor) - field sampling, laboratory analyses and report preparation for Gulf of Mexico and Clearwater Harbor - St. Joseph Sound surveys.

- Dr. Kendall Carder (Consultant, University of South Florida) - consideration of worst-case conditions for the potential movement of wastewater from a Gulf outfall toward barrier island beaches in the Study Area.

- Dr. Robert Hodson (Consultant, University of Georgia) - assistance with evaluating the results of the Gulf survey and an assessment of nearshore Gulf ecological resources.

TABLE 14

NORTH PINELLAS COUNTY, FLORIDA EIS MEMBERSHIP ON ADVISORY COMMITTEES

Citizen Review Committee

Clearwater Audubon Society	Ms. Helen Hause Ms. Valore Marcinak
League of Women Voters	Mrs. Mary James Ms. Jane Goshen
Save Crystal Beach, Inc.	Mrs. Olga Close Ms. Carol Harding
Suncoast Girl Scount Council, Inc.	Ms. Sandy Hupp
Save Our Bays	Mrs. Dorothy Sample
Sierra Club, Suncoast Chapter	Mr. Edward Hamm Mr. Haughton Sanguinette
Anchorage Homeowners Associations	Mr. Joe Preston Mr. James Russell
Innisbrook Condominium Association	Mr. William Gand Mr. John Means
Tarpon Woods Golf and Country Club	Mr. Rocco Capabianco Mr. Lloyd Ferrentino
Clearwater Chamber of Commerce	Mr. Will Alexander, III
Pinellas County Sewer System	Mr. William Dunn Mr. Todd Tamberg
City of Tarpon Springs	Mr. Preston Baker Mr. John Laliotis
City of Dunedin	Mr. Parwez Alam
City of Oldsmar	Mr. Sandy Francisco Ms. Sue Ann Murphy
City of Clearwater	Mr. Anthony Shoemaker Mr. Max Battle
Tampa Bay Regional Planning Council	Mr. Michael McKinley Mr. David Crawford Mr. William Ockunizzi

TABLE 14
(Continued)

Citizen Review Committee

Florida Department of Environmental Regulation	Mr. Robert Harnly Mr. Gene Sullivan Mr. Don Moores
Southern Offshore Fishermen's Association	Mr. Alex Lamont
Committee for Clean Air and Water	Ms. Mary Mosely Ms. Kathy Fox

Technical Advisory Committee

United States Department of the Interior, National Marine Fisheries Services (Panama City)	Mr. Ed Keppner Mr. Mark Thompson
United States Department of Agriculture, Soil Conservation Service (Tampa)	Mr. William Saalman
Florida Department of Health and Rehabilitative Services (Tampa)	Dr. Flora Mae Wellings Dr. A. L. Lewis
Florida Department of Environmental Regulation (Tampa)	Mr. Robert Harnly Mr. Gene Sullivan Mr. Don Moores
University of South Florida, Marine Laboratory	Dr. Kent Fanning
University of South Florida, College of Engineering	Dr. Bernard Ross
St. Petersburg Junior College	Dr. Heyward Mathews
Pasco County	Mr. William Duynslager
Pinellas County Planning Department	Mr. Gordon Beasley Ms. Janet Ley

TABLE 15
AGENCY COORDINATION LIST

Local Agencies

City of Clearwater, Department of Public Works and Water Pollution Control Division

City of Dunedin, Pollution Control Department

City of Oldsmar

City of Tarpon Springs, Engineering Department

Pinellas County Sewer System

Pinellas County Water System

Pinellas County Planning Department

Pinellas County Health Department

Pinellas County Department of Environmental Management

City of St. Petersburg

Hillsborough County Environmental Protection Commission

Regional and State Agencies

Florida Department of Environmental Regulation, offices in Tampa and Tallahassee

Florida Department of Natural Resources, Division of Marine Resources

Florida Department of Health and Rehabilitative Services

Florida Game and Fresh Water Fish Commission

West Coast Regional Water Supply Authority

Southwest Florida Water Management District

United States Government

United States Environmental Protection Agency, Research Laboratories in Athens, GA and Cornvallis, OR

United States Department of the Interior, Fish and Wildlife Service in Jacksonville, FL

United States Army, Corps of Engineers in Jacksonville, FL

United States Geological Survey in Tampa, FL

United States Department of the Interior, National Marine Fisheries Service in Panama City, FL and in Miami, FL

- Dr. William Sopper (Consultant, Pennsylvania State University) - assistance with the evaluation of numerous sites in the study area for slow-rate and rapid-rate land application.

Other specialists were contacted as the environmental impacts of various wastewater disposal alternatives were being evaluated. These specialists and the type of assistance they provided were as follows:

- Dr. Karen Steidinger of Florida DNR in St. Petersburg for information in red tides and bacteriological water quality concerns;
- Dr. Alex Dragovich, presently of the National Marine Fisheries Service in Miami, who formerly studied red tides and water quality in the Tampa area;
- Drs. Larry Olson and Landon Ross of Florida DER regarding fishkills and water quality in the Tampa Area;
- Messrs. Harold Leadbetter and Vernon Fraser of the Pinellas County Health Department for information regarding Class III waters and bacteriological water quality concerns;
- Mr. Mike Sprague of Florida DNR at Punta Gorda for information on shellfish waters;
- Mr. Jack Hickey of the U.S. Geological Survey in Tampa and Mr. Dean Hughes of the St. Petersburg Utilities Department for information on geology and deep-well injection;
- Mr. Earl Gehant, of the Pinellas County Department of Environmental Management and Mr. Rick Wilkens of the Hillsborough County Environmental Protection Commission regarding water quality concerns; and

- Messrs. Scott McClelland and Randy Armstrong of Florida DER in Tallahassee about the wasteload allocation process in Florida.

CHAPTER VI

LIST OF EIS PREPARERS

PROJECT PERSONNEL

U.S. ENVIRONMENTAL PROTECTION AGENCY

Robert B. Howard	Chief, NEPA Compliance Section
F. Theodore Bisterfeld	EPA Project Officer, June 1979 - November 1983
Ronald J. Mikulak	EPA Project Officer, November 1983 - Present
Philip Vorsatz	North Pinellas 201, Project Engineer
Artie Buff	Central Pinellas 201, Project Engineer
Eugene Coker	Engineer, Water Supply Branch

GANNETT FLEMING CORDDRY AND CARPENTER, INC.

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David B. Babcock, P.E.	Assistant Project Manager
James R. Fuller	Engineer
John W. Jacobs	Soils Scientist
Amy E. Lucas	Environmental Scientist
P. Andre DeGeorges	Environmental Scientist
W. Peter Wickwire, P.E.	Engineer

CTA ENVIRONMENTAL, INC.

Claude E. Terry, Ph.D.	President
R. Gregory Bourne	Project Manager
Craig H. Wolfgang	Environmental Planner
Thomas C. Mather	Environmental Scientist
James C. Hodges	Environmental Scientist

CHAPTER VII

REFERENCES

The following references are ones which were particularly useful in preparing this Draft EIS. Numerous other references were reviewed by the EIS preparers and by Mote Marine Laboratory.

All of the listed references are arranged alphabetically within key subject areas: surface water resources, groundwater resources, terrestrial resources, marine ecology, population and land use, municipal wastewater management, on-lot and small community wastewater management, Gulf outfall, land application - water reuse, deep-well injection, and community facilities.

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APPENDIX A

ENVIRONMENTAL IMPACTS COMMON TO ALTERNATIVES

There are several environmental impacts which are common to several or all of the alternatives. Many of these impacts are temporary in nature, such as those impacts resulting from construction activities.

1) Natural Environment

Noise - Each alternative will have a temporary noise impact during construction activities. The noise of heavy construction equipment will be limited to daylight hours and will be fairly localized. Other noises will emanate from pumping stations, sprinkler heads, and other wastewater facilities equipment. Noises will primarily emanate from controlled rights-of-way. Buffer zones can adequately control noise problems that could arise due to wastewater management activities.

Air Quality - construction activities can result in temporary air quality degradation at a construction site, consisting of exhaust emissions and dust.

If ammonia stripping is ever implemented in the Study Area to remove nitrogen from wastewater, the ammonia would be released to the atmosphere. Ammonia can combine with sulfur dioxide to form ammonium sulfate under normal atmospheric conditions. Ammonium sulfate would not be a serious problem at the concentrations anticipated near an ammonia stripping tower.

Topography - The topography of any site may be permanently altered by the construction of any man-made wastewater treatment facilities or transmission lines. It is unlikely that these impacts will even be measurable because much of Pinellas County is quite flat, near sea level and already densely developed. Impacts on topography will consist of either excavation of filling activities.

Geology - Construction activities can affect the bedrock geology in two ways. Where instabilities such as underground solution cavities exist, the use of heavy construction equipment could cause a spontaneous collapse of the bedrock. The other effect, that construction of treatment facilities and transmission lines could require blasting to remove any bedrock "pinnacles," is also relatively unlikely. Mitigative measures would consist of detailed geologic surveys during the final design phases to minimize or eliminate these potential problems.

Any wastewater treatment or disposal alternative that does not conserve water may result in the formation of sinkholes wherever water is withdrawn. In light of the rapid appearance of sinkholes during May 1981 in the Orlando and Tampa areas as a result of the recent drought, the public should be aware of these geologic impacts. The impacts are not, however, a direct result of wastewater management activities.

Conversely, injection of relatively large quantities of wastewater at a deep-well injection site can fill gaps and caverns in fractured bedrock. Some localized, additional stability would then be available. More dissolution of rock minerals to the injected wastewater could also take place.

Soils - Soils will be slightly impacted by any construction activity. Some compaction will occur from heavy equipment, while excavation will change the soil profile. However, the soils within the study area consist primarily of fine sands which do not compact greatly when disturbed. Soils would also be impacted by land application techniques using secondary effluent. Secondary effluent contains a relatively high level of suspended solids that can clog soil pores if additional filtration is not provided before application. Mitigative measures could be applied, such as reducing application rates or disking the topsoil to allow the soil to adequately treat the effluent.

Surface Water Quality - All surface water discharge alternatives would transfer fresh surface waters to saline waters, and all land application and deep-well injection alternatives would remove fresh surface waters from the aquatic environment to the soil. Other, more important impacts are discussed in Chapter III of this Draft EIS.

Groundwater Quantity - Rapid-rate land application and water reuse of filtered effluent would add to the groundwater supply. The land parcels through which this water would be applied are not large contiguous parcels, but they are adequate to increase groundwater quantities in their immediate vicinities. In rapid-rate systems, most of the applied effluent would reach the groundwater.

Deeper groundwaters would be replenished by deep-well injection systems. There is a belief that effluent could eventually form a reservoir of fresh water. Such a reservoir would be a minor benefit in the years immediately following construction, if the water could be used for lawn sprinkling. This freshwater may become more valuable in the distant future.

Groundwater Quality - The input of treated effluent to the groundwater is not expected to significantly impact on groundwater quality. Neither rapid-rate land application (or wastewater reuse) systems nor slow-rate land application should add large quantities of pollutants to the groundwater if the systems are operating properly. Effluent would receive additional treatment as it percolates vertically through the soil column. Methods for operating land application and water reuse systems are available which maximize the uptake of solids, metals, nutrients, organic compounds and microorganisms by soil partides.

Deep-well injection could result in a localized slower rate of ongoing saltwater intrusion within central Pinellas County. Monitoring wells would be useful for detecting changes in groundwater quality.

No noticeable impacts are anticipated to result at public water supply wells due to any of the possible wastewater management activities. Treated effluent which would be applied to lands is supplementally treated within the soil column and unable to migrate horizontally to a water supply well as long as the well is far enough away to prevent horizontal migration of effluent due to pumping at the well. For deep-well injection, a 50-foot thick confining layer between injected waters and potable waters will be required based on State of Florida regulations. Such a confining layer should assure separation of treated effluent from potable waters. Test holes and injection tests would be required for over two years prior to full-scale implementation of any deep-well injection operation.

Terrestrial Ecosystem - All the alternatives that require any new construction would result in the disruption of terrestrial habitats. Any disruption may be permanent but losses would be expected to be minimal. Attempts should be made to locate wastewater transmission lines along existing rights-of-way wherever possible.

Expansion of treatment facilities or construction of new facilities would permanently remove vegetation. However, these impacts would be small when compared to the rapid pace of residential development.

2) Man-Made Environment

Population - None of the alternatives are assumed to impact population projections. Current development pressure within the study area is high. Populations could reach the year 2000 levels regardless of which wastewater management alternative is to be implemented. Any removal of lands from development, such as in land application systems, would not have an impact on population growth. In order to acquire lands from developers for land application, lands would probably be permitted to develop at a higher density elsewhere.

Land Use - Potentially developable land will be occupied by wastewater transmission lines for all alternatives that require new construction, although attempts can be made to locate them along existing rights-of-way. Other lands needed for either land application or deep-well injection would be permanently removed from development.

Archaeological and Historical Resources - An archaeological/historical site survey should be performed prior to any final design of interceptor routes. Assuming that any identified sites are avoided or are excavated prior to construction, adverse impacts on archaeological and historical resources would not occur.

Natural Resource Use - Advanced wastewater treatment systems generate more sludge than secondary treatment systems. By increasing flows to the projected year 2000 levels at existing plants, sludge production would also be increased. This increase could be handled by the proposed county-wide sludge disposal system. In either case, these larger amounts of sludge will be available for use as a soil conditioner. If sludge is not reused as a soil conditioner, then other land disposal methods will need to be utilized.

APPENDIX B

THREATENED AND ENDANGERED SPECIES

Federal and state laws provide for the listing and protection of threatened or endangered species; many of these species rely on ecologically sensitive areas for food and habitat. Nine species are listed as threatened or endangered in Pinellas County under the federal Endangered Species Act of 1973 (PL 93-205). The State of Florida lists an additional 41 animal species and 19 plant species as either endangered, threatened, or species of special concern. State and federally listed species are indicated in Tables B-1, B-2, and B-3.

TABLE B-1

FEDERALLY ENDANGERED AND THREATENED ANIMALS FOUND IN THE PINELLAS COUNTY AREA(1)

Common Name	Species	Status(2)	Primary Habitat(s)
REPTILES			
American Alligator	*Alligator mississippiensis*	T	Swamps, Marshes, Ponds
Atlantic Ridley Turtle	*Lepidochelys Kempii*	E	Coastal Waters
Atlantic Leatherback Turtle	*Dermochelys coriacea*	E	Coastal Waters
Atlantic Loggerhead Turtle	*Caretta caretta*	T	Coastal Waters
Indigo Snake	*Drymarchon corais*	T	Pine Flatwoods, Sandhills, Swamps, Marshes
BIRDS			
Bald Eagle	*Haliaeetus leucocephalus*	E	Lakes, Rivers, Swamps and Coastal Waters
Brown Pelican	*Pelecanus occidentalis*	E	Coastal Waters and Mangroves
Bachman's Warbler	*Vermivora bachmanii*	E	Hardwood Swamps and Forests
MAMMALS			
Florida Manatee	*Trichechus manatus*	E	Coastal Waters and Streams

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(1) Source: U.S. Department of Interior, Fish and Wildlife Service, 1977. Endangered and Threatened Wildlife and Plants. *Federal Register*. Vol. 42, No. 135, July 14, 1977: 36420-36431.

(2) T = Threatened; E = Endangered.

TABLE B-2

ANIMALS FOUND IN THE PINELLAS COUNTY AREA WHICH ARE PROTECTED BY FLORIDA LAWS

Species	Status[1]	Primary Habitat[2]
Fishes		
**Atlantic sturgeon, Acipenser oxyrhyncus	SSC	Rivers, coastal waters
*Rivulus, Rivulus marmoratus	SSC	Saltmarshes, mangroves
Amphibians		
**Florida gopher frog, Rana areolata	SSC	Sandhills
Reptiles		
**American alligator, Alligator mississippiensis	SSC	Freshwater wetlands
**Leatherback turtle, Dermochelys coriacea	E	Estuaries, coastal waters
**Atlantic ridley turtle, Lepidochelys kempi	E	Estuaries, coastal waters
**Atlantic loggerhead turtle, Caretta caretta	T	Estuaries, coastal waters
**Suwannee cooter, Chrysemys concinna suwanniensis	SSC	Rivers
**Gopher tortoise, Gopherus polyphemus	SSC	Sandhills
Sand skink, Neoseps reynoldsi	T	Sandhills
**Short-tailed snake, Stilosoma extenuatum	T	Sandhills
**Eastern indigo snake, Drymarchon corais couperi	T	Pine flatwoods, Sandhills
Birds		
**Eastern brown pelican, Pelecanus occidentalis carolinensis	T	Estuaries, mangroves
*Wood stork, Mycteria americana	E	Wetlands
**Bald eagle, Haliaeetus leucocephalus	T	Wetlands
Everglade kite, Rostrhamus sociabilis plumbeus	E	Freshwater marshes
**Southeastern kestrel, Falco sparverius paulus	T	Pine forests
**Peregrine falcon, Falco peregrinus	E	Coastal swamps
*Audubon's caracara, Caracara cheriway audubonii	T	Native pastures
**Burrowing owl, Athene cunicularia	SSC	Sandhills, pastures
**Cuban snowy plover, Charadrius alexandrinus tenuirostris	E	Beaches, estuaries
**Florida sandhill crane, Grus canadensis pratensis	T	Freshwater marshes
**American oystercatcher, Haematopus palliatus	SSC	Beaches, estuaries

TABLE B-2
(Continued)

Species	Status[1]	Primary Habitat[2]
**Little blue heron, *Florida caerulea	SSC	Wetlands
**Snowy egret, _Egretta thula_	SSC	Wetlands
**Louisiana heron, _Hydranassa tricolor_	SSC	Wetlands
**Roseate spoonbill, _Ajaia ajaja_	SSC	Mangroves
**Limpkin, _Aramus guarauna_	SSC	Freshwater marshes, lakes
**Roseate tern, _Sterna dougalli_	T	Beaches, estuaries
**Least tern, _Sterna albifrons_	T	Beaches, estuaries
**Red-cockaded woodpecker, _Picoides borealis_	T	Pine forests
**Florida scrub jay, _Aphelocoma coerulescens_	T	Sandhills
**Marian's marsh wren, _Cistothorus palustris marianae_	SSC	Saltmarshes
Bachman's warbler, _Vermivora bachmanii_	E	Hardwood swamps
Kirtland's warbler, _Dendroica kirtlandii_	E	Thick scrubs
*Scott's seaside sparrow, _Ammospiza maritima_	SSC	Saltmarshes
Florida grasshopper sparrow, _Ammodramus ssavannarum floridanus_	E	pastures
Mammals		
**Sherman's fox squirrel, _Sciurus niger shermani_	SSC	Sandhills
**Florida mouse, _Peromyscus floridanus_	T	Sandhills
*Florida black bear, _Ursus americanus floridanus_	T	Swamp forests
**Caribbean manatee, _Trichechus manatus latirostris_	E	Estuaries, coastal rivers

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** Species known from Pinellas County.
* Species known from counties adjacent to Pinellas.

[1] Florida Game & Fresh Water Fish Commission. Chapter 39-27, Rules Relating to Endangered or Threatened Species.
E = Endangered
T = Threatened
SSC = Species of Special Concern

[2] Pritchard, P. (ed.). 1978. Rare and Endangered Biota of Florida. Univ. Presses of Fla.: Gainesville.

TABLE B-3

PLANTS FROM THE PINELLAS COUNTY AREA WHICH ARE PROTECTED BY FLORIDA LAWS

Species or Group	Common Name	Status[1]	Habitats (Comments)
** ARECACEAE (Family)	Palm Family	T	Various (all native species except Serenoa repens)
** Asclepias curtisii	Sandhill milkweed	T	Sandhills
Asimina pygmaea	Pink pawpaw	T	Old fields, pines
* Asplenium auritum	Auricled spleenwort fern	E	Epiphytic on large live oaks
Blecknum occidentale	Sinkhole fern	E	Ravines, dense hammocks, sinkholes
** CACTACEAE (Family)	Cactus Family	T	Various. (All native species except prostrate Opuntia spp.)
Calycanthus floridus	Strawberry bush	T	Lowland hardwoods
Ceratiola ericoides	Sand cedar	T	Sandhills, scrub
Cercis canadensis	Redbud	T	Upland forests
* Cereus gracilis	Prickly apple cactus	E	Mangroves, shell mounds
Chionanthus virginicus	Fringetree	T	Upland forests
Cornus florida	Flowering dogwood	T	Upland forests
** FILICINEAE (Class)	Fern Families	T	Various (All native ferns except Osmunda sp. and Pteris aquilinum)
** Ilex spp.	Hollies	T	Various (All native species except Ilex glabra)
Ionopsis utricularioides	Delicate ionopsis orchid	E	Hammocks
Liatris ohlingeri	Gayfeather	T	Sandhills
Lilium catesbaei	Pine lily	T	Pine flatwoods
Lobelia cardinalis	Cardinal flower	T	Freshwater wetlands
** ORCHIDACEAE (Family)	Orchid Family	T	Various (All native species)
Pavonia spinifex	Yellow hibiscus	T	Sandy woods, hammocks
Polyrrhiza lindenii	Ghost orchid	E	Cypress swamps
Sarracenia spp.	Pitcher plants	E	Freshwater marshes, wet meadows (All native species, but only S. Minor occurs in area)
Scaevola plumieri	Scaevola	T	Beach dunes
* Smilax smallii	Jackson vine	T	Hardwoods, hammocks, ravines
Tillandsia fasciculata	Wild pine bromeliad	E	Epiphytic on pines
** Zamia spp.	Coonties	T	Sandhills (All native species)

TABLE B-3
(Continued)

Species or Group	Common Name	Status[1]	Habitats (Comments)
Zephranthes atamasco	Atamasco or Zephyr lily	E	Low woods, wet meadows
Zephranthes spp.	Zephyr lillies	T	Various (All white species)

Occurence[2]
** Species or group known from Pinellas County
* Species or group known from counties adjacent to Pinellas

[1] T = Threatened; E = Endangered. In cases where endangered species are members of threatened groups, the endangered status applies only to those species listed as such.

[2] Occurrences determined from various sources: Ward (1978); Brockman (1968); Small (1933); Long & Lakela (1971).

APPENDIX C

MARINE SAMPLING AND MEASUREMENT PROGRAM OFF NORTHERN PINELLAS COUNTY, FLORIDA

BASED ON INFORMATION SUBMITTED BY:	Mote Marine Laboratory Sarasota, FL

A Marine Sampling Program in the Gulf of Mexico off Northern Pinellas County (Florida) was conducted by Mote Marine Laboratory during two periods: May 27 through June 2, 1980 and October 13 through November 4, 1980. The Marine Sampling Program was conducted as part of the EIS to collect data to develop a Gulf outfall alternative for wastewater disposal to consider along with other disposal alternatives. The Marine Sampling Program was also designed to generically demonstrate the evaluation methodology that should be used in considering a Gulf outfall.

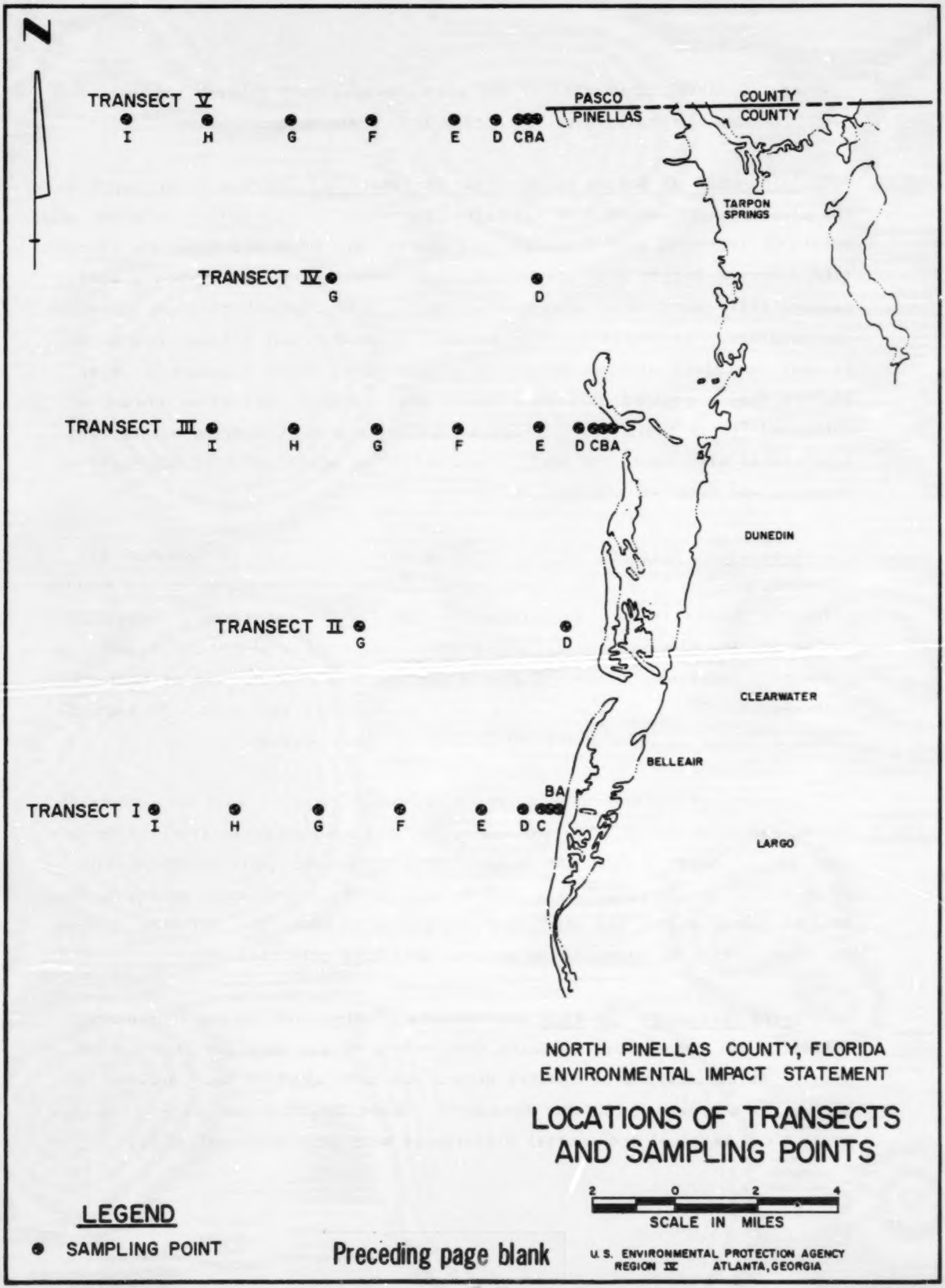
Physical, meteorological, chemical, biological and sediment data were collected from a 512 square kilometer sampling area in the Gulf of Mexico from Anclote Key (north) to Belleair Causeway (south) and up to 16 kilometers offshore from the barrier islands off Northern Pinellas County. Data were collected from three east-west transects within the sampling area (except for the artificial reefs study and the current study, where two additional transects were sampled) (see Figure C-1).

Data from the sampling program clearly show that:

(a) Waters in the area are well mixed.

(b) Sensitive ecological habitats occur in the area.

(c) Planktonic communities in the area are comparable to other nearby natural environs (and are productive).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NORTH PINELLAS COUNTY, FLORIDA
ENVIRONMENTAL IMPACT STATEMENT

LOCATIONS OF TRANSECTS AND SAMPLING POINTS

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV ATLANTA, GEORGIA

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FIGURE C-1

(d) Benthic communities of the area are extremely diverse and may be sensitive to any alteration or discharge.

Bathymetry and Bottom Habitat Characterization: Average water depth in the sampling area ranged from 1.5 meters nearshore to 13.9 meters offshore, and generally increased with distance from shore. Six substrate types are identified (through bottom photographs and video coverage) in the sampling area, namely, silty sand, sand, shelly sand, coarse shell, hard-bottom and limestone outcroppings. Transects 1 (near Belleair causeway) and 3 (near Honeymoon Island) contained similar substrate distribution, while Transect 5 (near Anclote Key) contained extensive coarse shell areas. All three transects contained "patch reefs" (consisting of hard-bottom and limestone outcroppings) interspaced with sandy and shelly sand areas. A small patch of unidentified seagrass was observed near Anclote Key.

Currents: Currents in the sampling area were weak to moderate in strength, ranging from 0 to 90 centimeters per second. Currents during falling tides ran faster than during rising tides. The general trend of currents during falling tides was toward the south; a westerly component was present and pronounced under east winds. Currents leaving inlets moved west at relatively high speeds. Shear between surface and bottom strata approached 180 degrees. Causes of shear included tides, winds and nearshore effects.

Meteorology: Winds were observed primarily from the east and northeast during the first sampling period (May-June) and predominantly from the northwest to northeast during the second sampling period (October-November). Average wind speeds ranged from 12.9 to 22.5 km/hr. In general, meteorological data collected during the study was comparable to historical information from the study area. No anomalous or unusual data were collected.

Water Chemistry: In situ measurements of dissolved oxygen (DO) content, salinity, and temperature indicate that waters of the sampling area are well mixed. Stratification of coastal waters was most apparent near Anclote Key during the wet season (October-November). Water temperatures ranged from 21.0 to 31.2°C. Vertical and spatial differences were generally negligible.

Nearshore waters were usually warmer than offshore waters. In terms of the other chemical parameters, the following averages and ranges were observed:

Chemical Parameters	May-June 1980 Mean	May-June 1980 Range	October-November 1980 Mean	October-November 1980 Range
a) Orthophosphate (mg/l)	0.016	0.006-0.060	0.012	<0.005-0.042
b) Organic Phosphorus (mg/l)	0.010	<0.005-0.022	<0.005	<0.005-0.011
c) Ammonia (mg/l)	<0.05	<0.05-0.08	<0.05	<0.05-0.07
d) Nitrite (mg/l)	<0.005	not detected	<0.005	not detected
e) Nitrate (mg/l)	<0.005	<0.005-0.025	<0.005	<0.005-0.029
f) Organic Nitrogen (mg/l)	0.21	0.15-0.72	0.45	0.26-1.33
g) 20-day BOD (mg/l)	2.0	0.8-5.9	1.7	0.8-4.8
h) Total Suspended Solids (mg/l)				
(i) Millipore filter	9.66	1.3-21.2	27.0	6.0-126.0
(ii) Reeves Angel filter	25.5	12.7-39.7	31.9	5.3-175.3

< means "less than"

The observed low values for nutrients are typical of nearshore Gulf of Mexico waters of this region. Nearshore 20-day BOD values were higher than corresponding offshore values and can be attributed to the higher concentration of oxidizable organics and larger number of aerobic organisms nearshore. Similarly, total suspended solids values decreased with distance from shore and can be attributed to terrestrial debris, vertical mixing and residence time of particulates in the water column. The influence of Anclote River upon the sampling area's chemistry appeared to be minimal.

Biological Characterization of Habitats: Bottom photography and video coverage provided a general description of the predominant habitats and associated epifauna in the sampling area. Five biotopes (corresponding to the major substratum types) occurring in the study area provide habitat for a diverse assemblage of fauna. At least twenty-one conspicuous epifaunal species were identified. 'Patch reefs' scattered throughout the sampling area supported diverse encrusting and epifaunal organisms (gorgonians, sea urchins, sponges, ascidians, etc.) and numerous fishes. Occasional expanses of sandy and shelly bottom had dense populations of sand dollars (Encope emarginata). The coarse shell areas supported sparse populations of a sea urchin (Lytechinus variegatus) and a starfish (Echinaster sp.). In general, the sampling area was heterogeneous in habitat distribution and consequently supported diverse and productive biological communities.

Rare, Threatened or Endangered Species: Opportunistic sighting records of officially listed endangered/threatened marine species were kept during both sampling periods. Brown pelicans (Pelecanus occidentalis) were found in large numbers during both sampling periods. During the first sampling period (May-June), ten sightings were logged, representing 19 dolphins (Tursiops truncatus) and one loggerhead sea turtle (Caretta caretta). During the second sampling period (October-November), twelve sightings were logged representing more than 49 dolphins and two unidentified sea turtles. No species currently recognized as "rare" were encountered.

Coliform Bacteria: Fecal and total coliform bacterial densities in the study area were extremely low. During the first sampling period, 97.6 percent of total coliform samples and 100 percent of fecal coliform samples exhibited no growth of coliforms on Millipore Coli-Count Sampler (i.e., <100 colonies/100ml). During the second sampling period, the membrane filter technique was utilized to increase the sensitivity of detecting coliform colonies. Fecal coliform bacteria were detected only at one nearshore station. Total coliform bacteria were more ubiquitous at the nearshore stations but always in low numbers (16/100 ml).

Phytoplankton and Chlorophyll 'a': Small unidentified phytoflagellates and diatoms were the predominant phytoplankters in the sampling area. Dinoflagellates were present but never dominant. Phytoplankton densities ranged from 1,130 to 17,000 cells/milliliter during May-June and from 415 to 16,200 cells/milliliter during October-November. The phytoplankton community of the nearshore stations was a typical estuarine-coastal assemblage in terms of species composition, density and diversity, while the offshore stations contained a greater proportion of oceanic species. Phytoplankton density and chlorophyll 'a' concentration generally decreased with increasing distance from shore.

Zooplankton: The zooplankton community of the sampling area was dominated by copepod nauplii and other copepods (*Paracalanus crassirostris*, *Oithona brevicornis* and *Oithona nana*). Meroplankton, including annelid larvae, molluscan veligers and ichthyoplankton, were sometimes abundant at the nearshore stations. Zooplankton density ranged from 47,900 to 733,000 organisms/cubic meter during May-June and from 45,900 to 264,000 organisms/cubic meter during October-November. The zooplankton community of the area was found to be a typically coastal assemblage of moderate diversity and high density. Methodology differences and higher natural productivity in the sampling area may account for the greater density values.

Benthic Infauna: A total of 31,100 benthic organisms were collected in the study. In terms of major groups, polychaetes, nematodes, amphipods, bivalves and cephalochordates dominated the faunal composition. In general, species diversity and richness was high, dominance low and the incidence of opportunistic species low. Spatial and temporal heterogeneity in species composition was high. Substratum heterogeneity in the sampling area is inferred to cause the extremely high diversity, large number of different species and lack of continuous communities over large expanses. In comparison to adjacent estuaries, the benthic fauna of the nearshore Gulf was found to be more diverse and spatially heterogeneous.

Artificial Reefs: Qualitative collections and photographic surveys of four artificial reefs (Tarpon Springs, Dunedin, Clearwater and Rube Allyn) in the sampling area indicated that the reefs are in different stages of biological colonization. Three types of materials were found forming the artificial reefs: concrete, steel, and tires. The artificial reefs were colonized by barnacles, bivalves, crabs, sponges, red, green and brown algae, hydroids, gorgonians, bryzoans, polychaetes, echinoderms, amphipods, ascidians and several fishes. Obvious differences in species composition between the reefs were observed and could be attributed primarily to the different ages of the artificial reefs. The biological communities of the artificial reefs are similar (but not identical to) nearby natural reefs, and the artificial reefs of the sampling area provide shelter and congregation area for some fish species.

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Sediment: Sediment analyses conducted as part of the benthic faunal study provided grain size and organic content data for the soft bottom habitats of the sampling area. Sediment grain size ranged from medium sand to very fine sand. Spatial and temporal variation in mean grain size was minimal. Organic content and silt/clay percentages were low for a majority of the stations. Nearshore stations of Transect 3 (near Honeymoon Island) contained a noticeably higher percentage of silt-clay and organically enriched sediments, possibly originating from St. Joseph Sound.

Offshore Dye Releases: To simulate movement and dispersion of an instantaneous injection of wastewater, Mote Marine Laboratory dropped Rhodamine WT dye twice at a location four miles west of the southern end of Honeymoon Island. Dye was released during an ebb tide on May 27, 1980 and at low tide on June 24, 1980. Wind and current measurements were made in conjunction with the two dye releases. Unfortunately the first release was monitored only for 6.5 hours due to subsequent darkness and not being able to locate the dye the following morning. The second release of dye was monitored for 39.5 hours. Dye measurements were made at a depth of 5 feet.

Dye released on May 27 moved southwest resulting from southeast to northeast winds and ebb tide. Movement of dye released on May 27 differed little from what would have been predicted. Dye released and tracked from June 24-26 moved to the south in the presence of westerly winds, even though the dye was predicted to move east-northeast to east-southeast in response to a rising tide during the first 6 hours and then turn south-southeast for approximately 8 hours. The dye released on June 24 exhibited a minimum horizontal dispersion of 5.5 after 27 hours of movement; such dispersion falls into agreement with mathematical dispersion equations.

Current measurements and dye monitoring both suggest that some factor, such as shoreline proximity or nearshore accumulated water mass inhibits easterly movement of water and soluble compounds toward the barrier islands. However, wide-ranging and absolute conclusions can not be made about effects of nearshore hydrodynamics on potential movement of a wastewater plume for the following reasons:

- Water movement information from different seasons and from different years is not available for the nearshore Gulf off Pinellas County. Even tidal movements alone can be extremely complex.

- No information about water movements is available at all when winds originate from the south.

- Wastewater density and other fluid properties differ from soluble dye properties.

- Wastewater would be released continuously forming a field of finite thickness.

Waste water could be transported eastward toward barrier island beaches under the following conditions (K. L. Carder, Personal communication, 1981). A strong W-SW wind opposing an ebb tide would provide vertical shear, carrying the surface water eastward, but permitting a return flow southwestward at a depth so that a large head will not build up along the shore. The subsequent flood tide would carry the wastewater toward shore. A six-hour mean, wind-aided eastward tidal velocity of 40 cm/sec would carry waste water a distance of 8 1/2 km during a flood tidal cycle. The 40 cm/sec value could be created by a 15 cm/sec mean flood current plus a 25 cm/sec mean wind-driven component. A 12.5 m/sec (28 mile per hour) wind will move a surface current at 25 cm/sec (2 percent of wind speed). Wind rose frequency data prepared for the Florida Power Corporation Anclote site may be available to allow calculation of the probability of such winds being sustained for more than 6 hours; this probability will be quite low.

One of the dye releases did approach the northern edge of Clearwater Artificial Reef.

Limitations of Data: Data from the Gulf sampling program can be utilized to describe the local Gulf environment. However, even with this relatively extensive sampling effort, a number of limitations remain in the analysis of a Gulf outfall wastewater disposal alternative:

- Data from less than 10 days during only one spring and one fall season are available;

- The three sampling transects are 10 miles apart on a north-south axis;

- Dye releases were not monitored during all types of wind conditions;

- Nearshore water movements have been measured by meter data and have been found to be highly variable largely because water movement is affected by changing wind patterns; and

- Variable conditions are evident along the floor of the nearshore Gulf.

These limitations should not deter future efforts to monitor the nearshore Gulf. However, such limitations need to be understood in order to properly predict impacts of a Gulf outfall.

APPENDIX D

A PRELIMINARY SURVEY OF METEOROLOGICAL, HYDROGRAPHICAL AND WATER QUALITY CONDITIONS IN CLEARWATER HARBOR - ST. JOSEPH SOUND, FLORIDA

BASED ON INFORMATION
SUBMITTED BY: Mote Marine Laboratory
Sarasota, Florida

A single day dawn-to-dust study was conducted to measure the following meteorological, hydrographical and water quality parameters in Clearwater Harbor - St. Joseph Sound (Florida) on February 20, 1981:

(a) Wind speed and direction
(b) Air temperature
(c) Percent cloud cover
(d) Water temperature
(e) Salinity
(f) Dissolved oxygen content
(g) pH
(h) Water transparency (Secchi)
(i) Water depth
(j) Currents
(k) Tides
(l) Nitrogen
(m) Phosphorus
(n) Total suspended solids
(o) Chlorophyll 'a'
(p) Fecal and total coliform
(q) Water column productivity
(r) Biochemical oxygen demand (BOD)

Ten locations were sampled for parameters (a) through (j). Three stations were sampled for parameters (k) through (r). At each location, samples were collected from two or three depths to address vertical water column variability. Sampling was repeated during both incoming and outgoing tides to account for tidal influence.

Light to moderate winds from the west to northwest prevailed during the study period. No rainfall and only scant cloud cover was present. Typical late winter conditions prevailed.

Information from currents and tides of the sampling area indicated:

- A westerly-south westerly flow with outgoing tides emphasizing the influence of Hurricane and Clearwater Passes in Clearwater Harbor;
- A northerly-north westerly flow with outgoing tides emphasizing the influence of Gulf waters via St. Joseph Sound and upper Clearwater Harbor;
- A westerly flow emphasizing the influence of Dunedin Pass on the central Clearwater Harbor;
- Current regimes in the southwest portion of Clearwater Harbor are unclear from the data;
- The influence of tides was strongly evident in the current data; and
- Currents in the area near Stevenson Creek are influenced by stream flow and wind.

Analysis of salinity and other *in situ* water quality parameters generally supported the circulation patterns described by currents and tides. The northern harbor area was influenced by Hurricane Pass and both causeway openings. Salinity patterns indicated the influence of Curlew and Cedar Creeks.

Dunedin Pass exerted a strong influence in the central harbor, and a stronger influence on the Mandalay Channel. Also, Stevenson Creek's influence is apparent in the Central Harbor.

The influence of Stevenson Creek was observed based on orthophosphate, total phosphorus, and nitrate data. The effect varied as the plume changed directions with tidal currents. The low concentration of ammonia, nitrite and nitrate indicated a nitrogen limited system. The distribution of total Kjeldahl nitrogen, chlorophyll 'a', biochemical oxygen demand, and total suspended solids exhibited no dominant spatial or temporal trends. Productivity data indicated low respiration and productivities, appropriate for February. Total and fecal coliform counts were well below the acceptable water quality standards for waters within the State of Florida at all stations, depths, and tide cycles.

APPENDIX E

ENVIRONMENTAL IMPACTS ASSOCIATED WITH A GULF OUTFALL

1) Introduction

A Marine Sampling Program was conducted as part of the EIS to collect data to develop a Gulf outfall alternative for wastewater disposal to consider along with other disposal alternatives. The Marine Sampling Program was also designed to generically demonstrate the evaluation methodology that should be used in considering a Gulf outfall. Physical, biological and chemical data have been obtained in the EIS Marine Sampling Program. The Study Area for the sampling program included 20 miles along the coast, from the Belleair Beach Causeway north to the Anclote River, and extended 10 miles offshore. Five east-west sampling transects were located throughout the Study Area. The Study Area, transects and sampling stations are located on Figure C-1.

A corridor considered less environmentally sensitive than other corridors evaluated in the Marine Sampling Program would be close to Transect 3, which extends west from Honeymoon Island. A point of discharge approximately four miles offshore and in roughly 30 feet of water (Station 3F) was selected for cost comparison and evaluation purposes. This corridor appears least damaging based on the available data from the Marine Sampling Program, modeling estimates of the behavior of an effluent plume, and other environmental studies of the nearshore environment. The suitability of a precise outfall alignment and point of discharge would require site specific analyses.

Of the numerous environmental factors to be considered, three were chosen as being the most important in the consideration of a Gulf outfall off the coast of northern Pinellas County: potential health and aesthetic impact at bathing beaches, ecological impact to natural reef hardbottom-limestone outcrops, and impairment of the beneficial uses of the manmade fishing reefs.

2) Beach Impact

To address the first factor, measurements of water movement were taken at different times and during various meteorological conditions to assess circulation patterns, and the influence of tides and winds. Values for water velocities which are representative of these data were input to three EPA models (PLUME, OUTPLM AND DKHPLM). Predictions of outfall plume movement and resulting pollutant concentrations for soluable constituents were made to determine whether coliform concentrations could jeopardize bathers or concentrations of other compounds would be objectionable.

Over 60 computer runs of the hydraulic models were made. Water depth, stratification, current velocity, flow, number of diffuser ports spacing were the variables in the simulated conditions. The EIS Marine Sampling Program data were used for the first three variables. Flows ranged from 9 MGD up to 43 MGD (year 2000 total Study Area wastewater flow).

"Blocking", an occurrence which reduces dilution of a buoyant plume as it rises toward the water surface, was assumed. Initial (vertical) dilutions of 43 MGD of effluent with a 50 port diffuser at a 30 foot depth would be approximately 40 to 100 depending on water velocities.

Horizontal movement of a plume and its dilution (spreading) at the surface was investigated as part of the sampling program by tracking a dye dumped near Station 3F during several meteorological conditions and by mathematical calculations. Physical dilution anticipated to result only from horizontal dispersion could range from 2 to 50 at a distance 5,000 feet from the discharge depending on the current speed.

Considering both initial dilution and horizontal dispersion of a chlorinated secondary-treated effluent of 43 MGD, water quality guidelines for toxic pollutants and standards for total and fecal coliform could generally be met less than 0.5 miles from a discharge. Nutrient concentrations could be reduced to 20 percent above background levels within two miles of a discharge into 30 feet of water. Effluent plume modeling indicates that it is unlikely that effluent would reach the beaches from a discharge near Station 3F. If effluent did reach local beaches, the pollutant concentrations would most probably be indistinguishable from background levels.

A conclusion that effluent would not be expected to reach the beaches from an outfall near Station 3F is further based on current measurements and dye movement observations. A lateral blocking effect was documented which inhibited dye movement shoreward under several meteorological conditions. The presence of the barrier islands, strong ebbing tides from between the islands and the nearshore water mass may all be factors in the blocking effect. Significant eastward movement of dye released near Station 3F did not occur even during consistent westerly winds. The data indicate, rather, a net southerly plume movement. Placement of a discharge several miles north of Transect 3 may negate the blocking effect, and increase potential circulation back to the beaches or into upper St. Joseph Sound where there are extensive grassbeds and shellfishing areas. Additionally, grassbeds are known to exist in the Gulf just north of Transect 5 offshore from Anclote Key. An outfall located off the coast near Tarpon Springs should therefore be avoided because of grassbed habitat value and the recreational and estuarine resources that could be affected.

Winds could influence movement of effluent. Prevailing winds for all months are from the northeast quadrants. Field data under these conditions have been obtained. Winds during March are the exception, when they are from the south. Field efforts yielded little water current data and no mass-transport (dye tracking) data for winds from the southerly (SE and SW) quadrants. No basis exists for predictions of current response and dye movement under this condition.

The modeling and conclusions mentioned above are based on observed conditions which would be expected to occur routinely. An unlikely but possible worst case condition has been postulated and also considered. It is defined as a persistent 30 mph west-southwest wind aiding a flooding tide surface current which may transport wastewater five miles to shore in six hours. A 180 degree shear would exist with the strong ebbing flows moving opposite to the underlying surface component. Although effluent may be driven to shore, the rapid multi-directional currents would greatly increase initial dilutions to such a degree that all pollutant concentrations would most probably drop rapidly to near background levels within several thousand feet of the discharge.

Placing a discharge four or more miles offshore from bathing areas should provide an adequate margin of safety and protect the public health. A substantial margin is considered necessary for the following reasons.

- Survival of viruses after discharge is uncertain. Viruses are difficult to detect and quantify. Studies have shown that the fate of bacteria in seawater is reasonably well known while the fate of viruses is very uncertain. They are deactivated less easily by chlorine than are bacteria, and disease can result from lower concentrations than are required for bacterial infection.
- Current speeds and directions are basically not predictable (see Appendix C).
- Dye movement during a southerly wind (a condition which may also facilitate wastewater movement toward the beaches) was not observed during the sampling program.
- Wastewater treatment plant upsets at critical times could result in high coliform and virus concentrations. However, there would be either two or six plants involved with an outfall making total absence of disinfection unlikely.
- Commercial interests in tourism would stand to loose heavily if beaches were impacted by an outfall. Based on public input in this EIS and the events of the Tampa Bay dredged spoil Gulf disposal controversy, the public will insist on considerable safeguards for the beaches.

The aesthetic conditions at the beaches can not be predicted. Odor cannot be modeled and possible floatables from an outfall do not behave at all like the dissolved constituents would within the water column. However, with secondary treated wastewater discharged at this distance offshore, objectionable conditions at beaches are not likely to occur when treatment plants are operated correctly.

3) Coral Reef Impact

Coral reefs are considered to be the most valuable nearshore open Gulf bottom habitat. Reefs are also extremely sensitive to impact from a wastewater outfall. The coral reef habitat along this area of the coast is quite patchy. Occurrence of this habitat has been surveyed along Transects 1, 3 and 5 to address this second major outfall evaluation factor. Transect 5 (the northern most transect extending west of Tarpon Springs) has the least amount (12.1 percent); Transect 3 has 27.8 percent; and Transect 1, the southern transect, has 40.3 percent. Transect 1 also supports the greatest diversity of bottom-dwelling marine invertebrate organisms.

A discharge in the vicinity of Station 3F would impact a shelly sand substrate. The data indicate that this substrate type and, in fact, all substrates sampled in the Study Area support rich and highly diverse communities of marine organisms. The immediate area of the outfall, probably a 100 - 200 feet radius, would be expected to experience a change in the bottom community due to the discharge. Outfall construction would physically destroy the organisms in the sediments, but recovery (recolonization) is known to be quite rapid. A coral reef, however, would not recover and destruction would be considered a permanent loss. Construction and operational impacts to the significant natural reef areas can best be minimized by not placing an outfall in the southern portion of the Study Area.

4) Manmade Reef Impact

The presence of four manmade fishing reefs in the Study Area is another major factor in outfall siting. Significant adverse impacts to these reefs should be avoided and potential operational impacts of an outfall should be minimized. The Dunedin Reef located 1.2 miles west-southwest of Station 3F could be impacted by a discharge near Station 3F. Calculations of achievable dilutions indicate that all standards related to reef usage can be met within this distance. A discharge could be sited at a greater distance from Dunedin Reef thereby providing the reef a greater degree of protection from potential outfall effects.

5) Summary

The following summary statements concerning a Gulf outfall are offered:

(a) It would provide the area with a reliable long-term wastewater disposal option;

(b) It would require a major investment of capital in a disposal option that would tend to discourage the environmentally preferred alternative of wastewater reuse;

(c) It would involve the environmental tradeoffs of minimizing impact to estuarine waters while increasing impacts to the Gulf (i.e., attractant to fish and other organisms causing impacts, bottom disruptions, community alteration, nutrient impact);

(d) It would remove a development constraint that would potentially promote higher density development and development in environmentally sensitive areas which are not suitable for on-lot or recycle wastewater management;

(e) Secondary treatment and disinfection of wastewater would be necessary to minimize adverse impacts of an outfall on local beaches;

(f) Station 3F was selected for detailed study to demonstrate the generic methodology for evaluating the Gulf outfall alternative. The area of Station 3F which is roughly four miles offshore from Honeymoon Island, was found to be less environmentally sensitive than other sites located closer to shore that were evaluated during the Marine Sampling Program;

(g) Station 3F appears to be more cost effective than other stations evaluated during the Marine Sampling Program based on estimated cost and combined impacts to public health, the St. Joseph Sound estuary and natural hardbottom reef habitat;

(h) Nearshore Gulf currents vary such that predictions of effluent movement from a discharge are uncertain. Dye discharged in the area of Station 3F during the Marine Sampling Program generally moved in a south-southwesterly direction. A discharge plume in the area of Station 3F would be expected to have minimal impact on the area's beaches;

(i) Any further consideration of discharge sites near Station 3F should focus on areas slightly north of the exact study location to further minimize impacts to usage of the Dunedin Artificial Reef;

(j) The precise outfall alignment and point of discharge would require additional site-specific analyses (i.e., site specific studies to select the exact outfall route, the discharge point and required mitigation);

(k) Any further consideration of Station 3F or any other potential Gulf outfall site would be subject to permit/administrative review and approval.